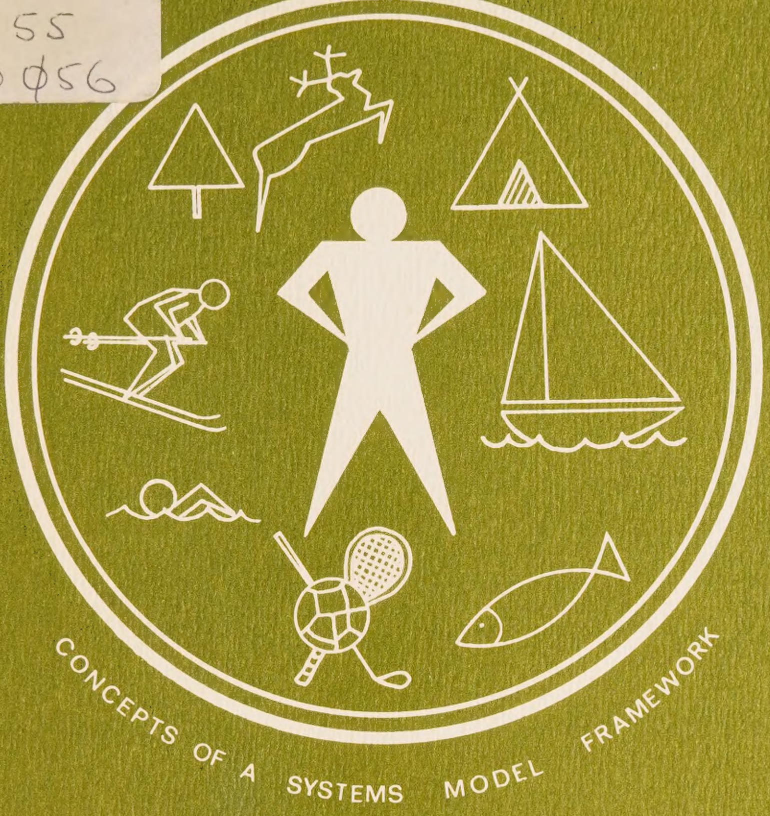

TOURISM AND RECREATION IN ONTARIO

TOURISM AND OUTDOOR RECREATION PLAN COMMITTEE • PROVINCE OF ONTARIO • KATES, PEAT, MARWICK & CO.

TOURISM AND

RECREATION IN ONTARIO

CONCEPTS OF A SYSTEMS MODEL FRAMEWORK

Prepared for the

Committee on Tourism and Outdoor Recreation Plan

Province of Ontario

by

Kates, Peat, Marwick & Co.

March 1970

ONTARIO

TOURISM AND OUTDOOR RECREATION PLAN

Powered by increases in population, affluence and leisure time, the demand for tourism and outdoor recreation facilities is growing in Ontario. This is readily apparent to the most casual observer. In order to provide an interdepartmental approach to planning for the challenges and opportunities inherent in this increasing demand, the Committee on Ontario's Tourism and Outdoor Recreation Plan was established in November of 1967. The general purpose of the Committee is to provide the required factual foundation, and to formulate alternative plans for the attainment of social and economic goals as defined in the Design for Development, in so far as they relate to tourism and outdoor recreation.

To gain further insight into the scale and process of current and prospective supply, demand patterns and interrelationships, the Committee contracted Kates, Peat, Marwick and Co. to compile this present study. Working in close conjunction with the Committee and its staff, the consultants formulated a hypothesis for a mathematical model describing the elements and their interrelationships in a tourism and outdoor recreation system - the subject of this report. The consultants are to be commended on the report they have produced. The hypothesis is an important step in the work of the Committee; the next step will be to apply the considerable amount of existing data and information resident in the government to this mathematical model.

Though the Committee and its staff have worked closely with the consultants in this project and in the development of this report, the statements, findings, conclusions, and recommendations are those of the consultants and do not necessarily reflect the views of the Committee.

We hope this report will prove of interest as a technical document for those working in the field of tourism and outdoor recreation research.

March 17, 1970

P. Klopchic

Dr. Peter Klopchic, Chairman,
Tourism and Outdoor Recreation
Plan Committee

TOURISM AND OUTDOOR RECREATION PLAN

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This report represents part of the work program carried out under a signed agreement between the Province of Ontario and Kates, Peat, Marwick & Co., dated June 9, 1969. Other information was submitted to the Tourism and Outdoor Recreation Plan Committee in the form of technical memoranda as follows:

1. Supply Data and Problems.
2. Demand Data and Problems.
3. Motivation.
4. Substitutability and Attractivity.
5. A. Flow Maps
   B. Historical Trends.

The consulting team on this study consisted of the following members:

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TOURISM AND

RECREATION IN ONTARIO

CONCEPTS OF A SYSTEMS MODEL FRAMEWORK

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I - INTRODUCTION

This section outlines the scope of work that has been conducted under Phase One of a two-phase contract entitled "Prototype Models Analysis" and dated June 9, 1969.

In a longe-range program outlined in a study design report* submitted to the Tourism and Outdoor Recreation Plan Committee on February 3, 1969, an initial effort was to include development of a model "designed to simulate the recreation activities of visitors and provincial residents, their travel from points of entry into the province and from population centres to recreation areas, and their use of lodging and other hospitality facilities. The model will also be used to forecast the growth of outdoor recreation and its distribution to different areas of the province. This model, based on existing incomplete statistics, is referred to as the prototype model".

At the direction of the Tourism and Outdoor Recreation Plan Committee, this initial effort was segmented into two parts. The first part, or Phase One, which is the subject of this report, was intended to provide a conceptual design and to decide upon the feasibility of building a prototype simulation model as defined above. The second part, Phase Two, was to program and run the model, suitably calculated to some base year.

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* Design of a province wide study for Tourism and Outdoor Recreation Planning by Kates, Peat, Marwick & Co. and Project Planning Associates Ltd., February 1969.

In fact, it has been necessary to go much further into the fundamental questions of tourism and outdoor recreation than was originally implied in the notion of a "prototype" model, i.e., a model based solely upon existing data and knowledge. We found that the restriction of our thinking to only those areas of tourism and recreation where data are now available was unrealistic, for this excludes most of <u>the fundamental aspects of human behaviour relating to outdoor recreation that underlie the phenomena which existing data measure</u>, such as attendance at Provincial Parks, occupancy of travel accommodations, traffic volumes on highways, and so forth.

We believe that we cannot make suitable formulations and recommendations regarding a prototype model without having done what we, in fact, have done: explored what an <u>unrestricted model of the tourism and recreation system would be like</u>. In the original study design report, such a model has been termed a <u>refined model</u>. Though we do not in any sense claim to have developed a refined model at this stage of the work - and, indeed, a refined model can by definition result only from repeated runs of a prototype model fed with new data on under-explored areas of recreation behaviour - we would like the reader to bear in mind that this report presents both an analysis of what a simulation model for tourism and recreation planning purposes should be like, and our recommendations for what the <u>initial</u> prototype model can be, given constraints of existing data and the level of funds available for development under Phase Two.

In our opinion, the work completed to date in exploring what a recreation system model really should be will be of the utmost practical value to the Government of Ontario, for two important reasons.

First, for many years, workers in recreational planning have repeatedly pleaded for "more data". In some cases, large and expensive programs have been set up to acquire various data. Most often, however, the data demanded and collected at great expense have pertained only to one narrow portion of the spectrum of tourism and outdoor recreation - typically only to those elements falling under the jurisdiction of one single agency of government. Items that could economically be gathered for another purpose were often omitted.

Perhaps more significant is the fact that while large sums have been expended in gathering inventory data on resources and recreation supply, the expenditures for data on people, their needs and behaviour, have been small, uncoordinated and sporadic. We know almost nothing, for example, about people who do not recreate in rural parks, and why they do not. We know more about habitats of sport fish than habits of sport fishermen.

Now, with the aid of the model and its broad framework, we can see the interrelationships between all elements of the problem and can show how data for planning decisions in one area may well serve purposes in another. We can also test the concepts and assumptions on which the model rests, and those on which various recreation planning processes rest - all on a consistent basis.

Second, and of much greater importance, is the comprehensive framework the model provides in which to use data that are gathered. When the proposed framework is implemented in a refined form, there need no longer be questions such as: Do we need such-and-such data? What data should be collected? If we did have such-and-such data, how would we use them, and how would they provide a better basis for planning decisions? The model, by its concepts and construction, shows which data are needed. It explicitly shows how the information will be processed and what portions of the entire problem are illuminated. It can also show the relative priorities of collecting different types of data; thus the Government may devise an efficient program to acquire new data in order of priority, and to reshape existing data-gathering programs in the most effective way.

This model framework has been developed for outdoor recreation on a Provincial scale, with implicit provision for extension into areas such as indoor recreation and/or recreation on a smaller or municipal scale. This is, unfortunately, an area in which available data are most sparse. We believe that it is of key importance to study the total leisure needs and activities of people, including how these are met in the home, in the community, in the urban region, and so forth. This has guided our thinking in casting the model framework, and the model provides a way of placing such knowledge into the perspective of the entire Ontario recreation system.

This work can put the Government of Ontario quite definitely in the vanguard of the field of planning for recreation and tourism. We know of no other government in the world that is so far advanced in developing a comprehensive tool for the planner to integrate and evaluate plans in this important sector of human activity and environmental resource use. Nowhere else does there exist a framework with such a potential for displaying the effect of leisure behaviour upon such a wide range of social and economic activities, and for identifying the geographical areas in which these effects will be felt. Even in academic research, we know of no work that is so far advanced in these respects. Yet the outcome of this work is not sheer academic speculation; it is a concrete design for a simulation model that can be made operational now. Though this is so only in a restricted sense in the prototype model, the work to date shows where development of this model will lead; the present report discusses both the explicit uses of the prototype model in planning, and how removal of its limitations through development would broaden the range of such uses.

The remainder of this section presents an outline of the general basis of the model and indicates its usefulness in planning, with respect to both the recreational planning process outlined in the study design report and the integration of recreational planning into the total Provincial planning process.

The other sections of the report deal with:

- the concepts of the model

- the details of making these concepts operational and the restrictions of the prototype stage of the model

- details of the use of the prototype in planning

- our conclusions that the construction of the prototype model is a feasible and desirable step at the present time.

GENERAL CONCEPTS OF THE MODEL

The discussion under the present heading will be broken into two parts, dealing with the general operational basis for the model and with the behavioural concepts of the recreation and tourism system it is designed to simulate.

In a discussion of operational concepts, the first factor to be borne in mind is that the model is a planning tool and is not, in itself, a plan. When the model is required to simulate the behaviour of the recreation system of Ontario, it must be supplied with some set of proposed developments of recreational resources, area by area, such as would appear in a comprehensive plan. What it will tell the user when he has fed this information in, however, is of key importance. It will indicate what level of usage these recreational resources will likely receive at some future date, if they are provided. It will tell the planner where the people using these recreational resources will probably come from, and to what degree the planned set of resources will meet the demands they might wish to make if resources were easily available to them.

In this sense, the model can act as a basis for the comparison of several alternative profiles or plans for recreational development, with respect to one another. It will show response to each plan on a uniform and consistent basis, allowing planners using the model to apply their own evaluation criteria such as cost-benefit, cost-effectiveness, goals-achievement, investment appraisal, etc. on a consistent basis, so as to enable them thereby to reach conclusions on the most beneficial development plan under given conditions.

A further very important use of the model will be to compare the alternative development plans for their sensitivity to possible future changes in the growth, composition or behavioural characteristics of the population.

The model will not and cannot tell its user how many people of a certain income, for example, will live in a certain area of the Province in 1980. Nor will it tell how many people will have a four-week vacation or a four-day week, nor how many people will prefer inner-directed mind-expanding experiences over active participation in outdoor sports.

What the model will do, however, is to accept as an input in quantified forms any of the above conditions that a planner may wish to test, and compute the effect that such a condition would have on people's patterns of recreation throughout the system. It will indicate the kinds of activities they would prefer, the use they would make of opportunities to engage in these activities, and what the geographical pattern of their recreation consumption would look like. In this sense, therefore, the

model provides a means for a planner to evaluate a proposed plan for its suitability under various assumptions regarding social and economic factors that may occur in the future.

Let us consider a simplified example. Suppose that two model runs are made with two different recreation plans fed in, but both are run under the assumption that people receive a four-week vacation and work a five-day week. The model will then compute the usage of recreational resources for each plan. Let us assume that a planner applies benefit criteria to this usage in some appropriate way, and when costs are considered, the two plans have similar benefit/cost ratios. Suppose that:

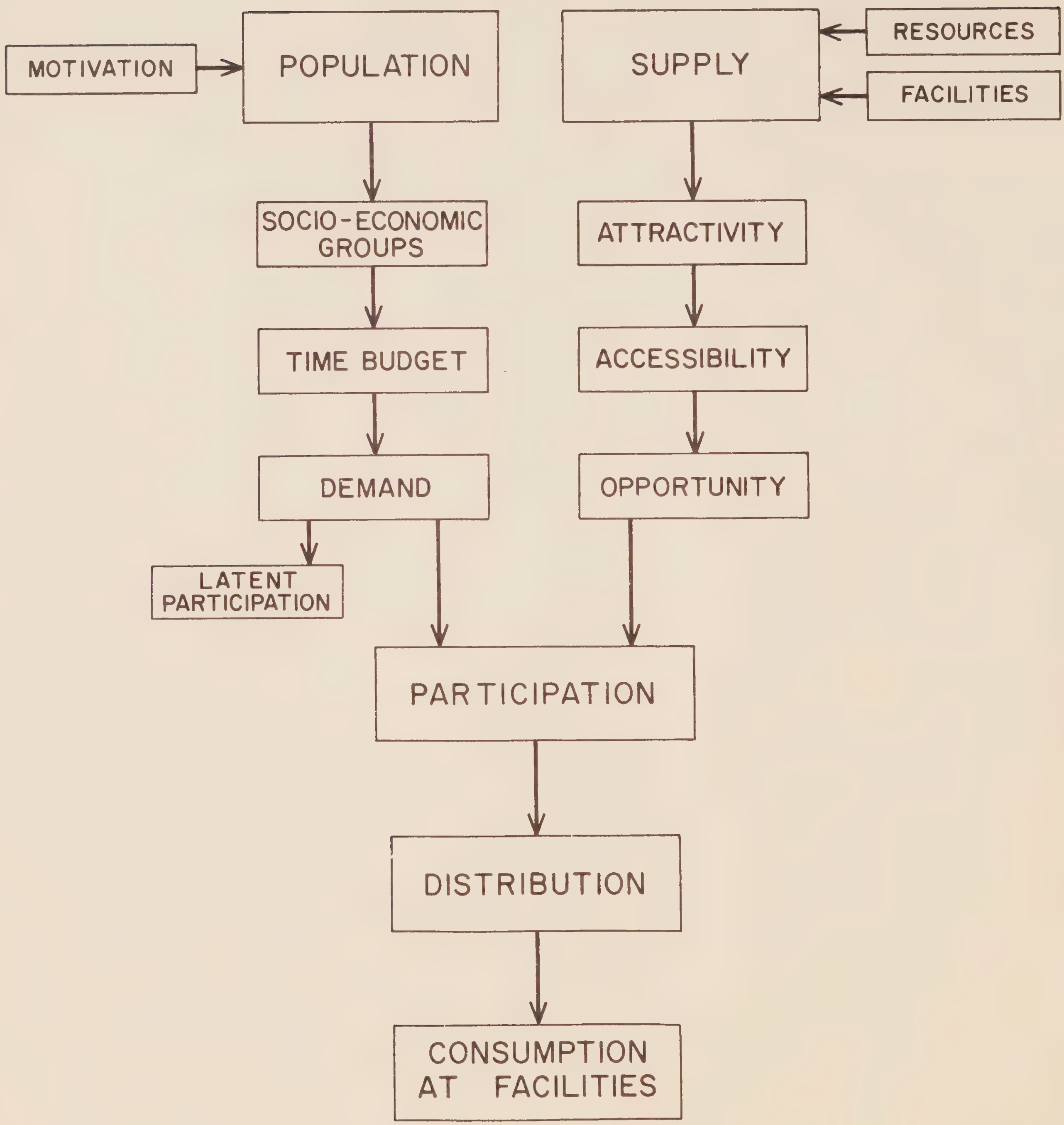
Plan A: has more emphasis on development of high-quality remote recreation areas and resorts

Plan B: has higher investment in man-made recreation areas near large cities.

Now consider that there is a possibility that people may receive only a two-week vacation but work a four-day week. The model would now likely show a much lower usage of recreational resources under Plan A than it would under Plan B, and a higher benefit/cost ratio for Plan B would ensue (if the benefit and cost criteria were the same as in the earlier analysis). A planner might see Plan B as providing somewhat of an "insurance" factor for the particular behavioural parameter of a four-day week, should it occur. With equality of benefit/cost under the most probable assumption, plans can be evaluated under less probable assumptions to see if the equality is maintained, or if, as in the extreme and simplified case chosen here, sharp differences occur. We might term such a basis for plan evaluation a "minimum regret" criterion.

FIGURE I-1

RECREATION DEMAND MODEL
GENERALIZED FLOW CHART



Behavioural Concepts

In considering behavioural concepts of the tourism and outdoor recreation system, we should probably start by discussing features that are of direct interest to the planner, and work back until we come to the aspects that deal with the behaviour of people.

What planners most want to know, when they propose a development for some geographical area, is: what will be the level of use of the area after the development has taken place? In terms of recreation, we must decide upon units to measure this use. Since recreation is not a homogeneous phenomenon, its separate component activities must be distinguished from one another. Different activities require different uses of the environment - or they may even require different environments - and this consideration is central to planning.

Clear definition of behavioural concepts is required. Figures I-1, opposite, shows a simplified version of the relationship between some of these concepts.

The region where a person recreates may or may not be his home or origin region. Since spatial imbalances of people and recreational resources are such important factors in planning, we will use distinctive terms for recreational usage, consumption and participation, to refer respectively to the case where the use is seen as resource pressure or people's behaviour. In order to study the movement of people within the recreation system the operational model requires a number of zones of residence and a number of zones of recreational resources and facilities to be defined.

Recreational use is normally measured on the basis of the number of person-days in specific activities, e.g., we speak of a certain number of camper-days in a Provincial Park, a certain number of boater-days on a lake, and so forth. When we consider recreational use of a particular geographic region, we will use the term consumption to denote the number of person-days, by activity, of recreational use of that area. Consumption figures are the primary output of the model, and they are central to the planning process in determining a wide range of issues, such as what economic impacts will be felt in a region, what ecological impacts will occur, and so forth. It is important to note that they do not of themselves, settle such issues.

Thus, one unit of consumption represents one person engaging in some recreational activity in a destination region for one day, or part thereof.

We will consider one unit of participation to represent one person in a given zone of residence engaging in the recreation activity under consideration. Participation is thus numerically equal to consumption, since these represent opposite views of some recreational-use occasions. Consumption measures volumes of recreational use actually taking place in a given zone of recreational opportunity, whereas participation is a measure of the volume of recreational use by the people living in a given zone of residence.

The mechanism that matches participation to consumption we call distribution. The distribution phenomenon can be represented as a series

of sub-models, one for each activity, that operate on a basis similar to that of transport models. That is, the distribution sub-models consider the attraction of all possible destinations for a particular trip-purpose and allocate the number of generated trips proportionally to this attraction. The attraction assumption is that if there are two sites equi-distant from a given residential location, more persons from there will go to the more attractive site, for a given recreation activity. Access from an origin zone to all destination zones is also operative in this sub-model, since we know that volume of trips decreases as length of the trip increases. The assumption for accessibility is that if there are two sites equal in attraction for a given recreational activity, but lying at different distances from a particular residential location, more persons from there will go to the closer site.

We still have another phenomenon to consider. The question of why the person wished to participate in the first place must be answered. We presume that the amount of participation a person will opt for in any recreational activity will be the result of a fundamental motivation process that is shaped by the opportunity that a person perceives to conduct the activity, and the presence or absence of alternatives to that activity. We call the amount of an activity in which a person would be willing and able to participate, if there were no constraints on availability of facilities or of access to them, his demand for that activity. When a person has a certain demand for an activity, he will participate in it up to that level*, depending on the

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* or even beyond that level in some cases, as is explained in Section II.

opportunith he has to do so. Demand can be considered to represent the effect of all personal, economic and social factors, <u>except</u> that of relative location of the person vis-a-vis recreational supply.

If opportunities are less than ideal, participation will be lower than demand. This is an important effect for the planner to consider, since, if a projection of consumption is based on participation data alone, the introduction of new opportunity through planning action may induce more usage than expected. This would occur through more demand being converted to participation than was the case previously.

A simple example will serve to illustrate some of these key concepts. Let us assume that a person is highly motivated towards skiing. Consider a two-month winter period when he has a seven-day vacation, and seven two-day weekends. His <u>demand</u> for skiing might well amount to 21 days, i.e., he would like to ski every weekend and every day on his vacation. Suppose the only ski slopes are in some zone A, 300 miles from his home, so that he can only ski on his vacation. His <u>participation</u> in skiing would then be 7 days, and his <u>consumption</u> would be 7 days in zone A. Assume that a new ski slope is built in zone B, 100 miles from his home. It is not as good as the one in zone A, but it is closer, and he now skis there on four weekends, in addition to his vacation in zone A. His participation is now 15 days, and his consumption is now 7 days in zone A and 8 days in zone B. Suppose a third area is opened in zone C only 20 miles from his home. He may well ski every weekend, and participate 21 days, with consumption of 14 days in zone C, nothing in zone B and still 7 days in zone A.

Note that a planner basing his use estimates for zone B and zone C slopes on participation data only might be grossly misled. On the one hand he might underestimate the phenomenon of induced participation from the "pool" of available demand and thereby under-design zone B facilities. On the other hand, he might forget that there are saturation limits to demand as well, and perhaps over-design zone C facilities, in anticipation of larger increases in participation, when facilities are provided nearby, than in fact occur.

INTEGRATION WITH OVERALL PROVINCIAL PLANNING

At this point in the present report, it is perhaps appropriate to step back, as it were, from the system model under discussion and to consider it in a wider context. This context is not only the position of the model in a comprehensive recreational planning process but, more important, the position of the recreational planning process in the overall Provincial programs of planning and regional development.

In this latter respect, we see the planning of the recreation system as a vital component in achieving the major objectives of the Province, as stated by the Honourable J. P. Robarts in the White Paper, _Design for Development_.[1] Two of the principal objectives were stated as "the provision of the best possible environment for our people and,

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1. _Design for Development_, Statement by the Prime Minister of the Province of Ontario on Regional Development Policy, Tuesday, April 5, 1966.

at the same time, the creation and maintenance of an atmosphere which will encourage economic growth and development throughout the province". The Government's philosophy was stated as being intended "to encourage and assist individuals to develop their full capabilities. . .", and where regional development is concerned, to "provide the basis whereby different regions or areas can develop their potential for specialization", an example of which might be tourism and recreation.

It is also important to note that the White Paper specified that "regional development will be contained within the broader spectrum of provincial development", and that the breadth and comprehensiveness of the program require that "we must gradually acquire the (planning) tools to forge ahead . . .", and "that our comprehensive research program will provide the necessary insight required to formulate development plans . . .".

From the outset our view of the recreational planning process has been that while the process must ultimately produce development plans for the recreational uses of land and other resources and for the economic growth of the tourist industry, it must have its central focus on people. There is now no doubt about the continuing economic health of Ontario, in terms of providing economic benefits such as jobs and housing for its citizens. Even on a regional basis, the capacity to mitigate disparities has increased to the extent that basic needs may be met virtually everywhere. On the social side, however, a fundamental assessment of the situation is urgently needed.

In such social aspects as education or health care, it is anything but a simple straightforward matter to assess what the needs of the people are and to devise means to fulfil them. But reasonably good statistics are available on, for example, how many children or sick people there are and will be in each region, what programs and facilities will be used, and so forth. Inter-regional exchange in these fields is slight, with the possible exception of universities and highly-specialized medical treatment facilities, and this certainly simplifies the planning problem.

In the field of recreation and tourism, however, the problem is immensely complex. Inter-regional exchange is one of the more significant aspects of the whole process of matching people to environments they desire. Also, and perhaps most crucial, environments for recreation and tourism cannot be created through monetary expenditures alone. They must be created through development of lands and resources that are extensive in area, are impossible to mass-produce (or even to "produce" at all, in some cases), and once developed are perhaps the most vital physical component of overall social amenity in determining the "livability" of a region or of the Province as a whole. The Prime Minister in his statement has stressed the concept that the provision of the best possible environment for people is <u>related</u> to economic growth and development. The latter can be severely restricted in a region if people who will live there find a lack of environmental amenity to a degree that inhibits them from developing their full capabilities - since leisure activities play so vital a role in the social development and well-being of individuals.

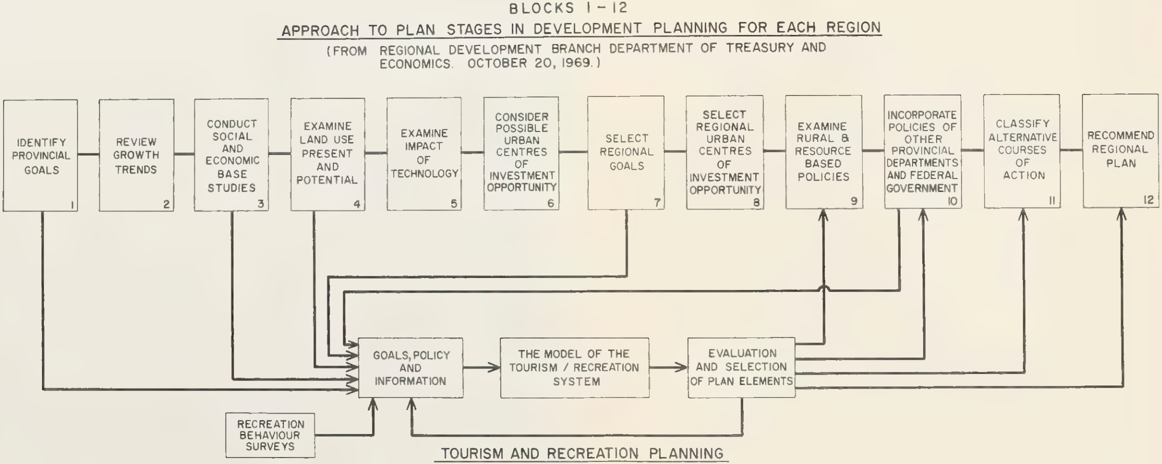
We see the recreation system model that will ultimately result from this present study as being an important part of the recreation planning process, though it would not actually <u>be</u> the whole process. Initially this process entails the assembly of goals, policies and fundamental data. The model then provides a series of pictures of how the recreation system would perform under the given sets of conditions. Evaluation and selection completes this process; thus these pictures are assessed and the recreation system selected whose performance <u>best fits in</u> with the overall picture of regional and Provincial development desired.

For example, it may be difficult in the early years to reconcile the non-urban oriented portions of existing recreation planning processes with a regional development program that is focussed on the concept of urban growth poles or centres of opportunity. This emphasizes the need for this model framework to include, as it does, all leisure, and for it explicitly to cover urban recreation and the uses of urban recreation resources. As experience is gained with the model, the coverage of such areas should improve along with data and understanding of the phenomena. This will enable the "filling in" of the many gaps which will have to be left in the first prototype model. The point is that total recreation <u>is in the framework</u> of the model. The framework will require filling in, <u>but not rebuilding</u>, as our concepts of people and their recreational needs and of recreational environments grow with understanding and study.

The model provides a uniform and consistent basis for arriving at pictures of performance of the total recreational system, and one

FIGURE I-2

INTEGRATION OF TOURISM AND RECREATION PLANNING WITH REGIONAL DEVELOPMENT PLANNING



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which is rapid and economical to use. Large numbers of alternative possibilities are always consistent with one another. In this way, there need be no commitment to any single static plan of recreational development; rather there can be a continued dynamic reassessment of the recreation system as developments occur within it or in other sectors, and as overall development of all sectors and regions is articulated.

Though we realize that the whole process of planning for regional development is still emerging and the form of the process might change, we would nevertheless like to use one illustration of the manner in which the recreation planning process fits in functionally with regional planning.

Figure I-2, opposite, is based on a recent enunciation [1] of the program by the Honourable C.S. McNaughton, Treasurer of Ontario and Minister of Economics, and shows how we think the interaction and interchanges between the planning process for the development of both the recreation sector and the overall region might take place.

We have shown the main inputs to and outputs from the process of tourism and recreation planning, and would like to stress the importance, in our view, of the various "feedbacks" and other iterative uses of the

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1. The Ontario Program for Regional Development, The Honourable C.S. McNaughton, Regional Development Branch. Approach to Plan: Stages in Development Planning for Each Region, dated October 20, 1969.

recreation model, even though we have not been able to show them diagrammatically.

With the above perspective, we now resume our discussion of the model and its prototype version in the following sections. The last one presents our conclusions regarding the potential of the model concept and its prototype to materially improve the Provincial planning process, both for recreation and for overall development.

II - SELECTION OF MODEL CONCEPTS AND POSTULATES

The purpose of this section is to enumerate and discuss the key concepts of the model and the steps that are needed to translate these concepts into operational elements of the model. Some twenty-two key behavioural concepts have been assimilated both from the existing recreational literature and from the extensive experience of the study team in the recreational field. We believe that these concepts include all essential features that any comprehensive model in the field of recreation must deal with explicitly.

In this section, we also discuss the influence of the state of existing data, presented in Technical Memoranda 1 and 2 for the supply and demand sides respectively, on our thinking in making the concepts explicitly operational. The concepts themselves were first assembled and discussed in Technical Memoranda 3 and 4, on motivation and on substitutability and attractivity, respectively. Some concepts have been excluded from the model process on the grounds that data to test hypotheses based on them were not available. Others have been excluded because the hypotheses derivable from them were either, in our judgement, untenable, or superfluous to the logic of the model, in terms of their usefulness in describing the behaviour of the recreation system. These are discussed in each specific case.

The aim of this selection process in structuring the model was always to achieve comprehensiveness in dealing with the recreation system. We believe it to be of the utmost importance to delineate the

behaviour of people in considerable detail, as well as to model the effects of access and the supply of recreational facilities on the operation of the system. People are at the heart of any recreational system, and the behavioural portions of the proposed model will represent one of its most important advances over any model used previously in the recreation field, in making the planning process sensitive to people's needs and aspirations, both as these change over time and as our population grows and changes and its distribution shifts over space.

At the same time, however, efficiency in construction and operation of the model was an important secondary goal in the modelling process. Nothing has been included merely for the sake of academic elegance in the model structure. Every part of the model, as we present it in this report, has its own essential part to play in describing the system. We feel strongly that while the model has enormous capacity to inform its user, it should not "over-inform" him by swamping him in a mass of output, of which he may only wish to use a portion for some specific purpose. We therefore have adopted an operational concept whereby the user who runs the model may select only those outputs which he desires and may suppress the others.

BEHAVIOURAL CONCEPTS AND POSTULATES

Demand, Consumption, Participation

The concept of demand as used in the present model has many similarities to the concept of demand used in the discussion of economic processes for consumer goods, but there are some important differences as

well. In economic terms, the demand for a good on a market consists of a schedule, usually displayed as a curve, which shows the amount of the good which will be consumed over a range of prices for the good. In most cases, demand drops as the price increases. The nature of shape of this decreasing curve, as well as the position it takes with respect to the axes of the graph, depend upon tastes of the consumers and the price of other goods. The amount of demand at some given price indicates the amount of <u>consumption</u> of the good which will occur at that price.

In the recreational field, many more complex influences bear on the "consumption" of an activity than the price paid to participate in it. The consumer must expend some amount of time in performing the activity. He may have to purchase market goods, such as boats, trailers, etc., and usually must expend time and money in travelling before and after participating. Qualitative factors of the different environments in which the activity is performed play a significant role, even to the extent that apparently the same activity may in effect, be several different "goods" if performed in different environments, e.g. swimming in a public pool versus swimming in a clear wilderness lake.

In the overall model concepts, we have incorporated carefully worked-out mechanisms which take into account both the access system or travel network as seen from the user's place of origin, and the differences in quality of given activities as they may be experienced in the different destination areas, and use of all these to modify demand in an appropriate manner.

We shall use the term demand to refer to the list or schedule of amounts of various recreational activities in which a given population group would be willing and able to participate, given that access to facilities is very easy (e.g. they exist in the group's own origin zone), that these facilities are of high quality, and that their capacity limits are not reached.

The major postulate leading from this concept of demand is that this demand depends solely on the specific characteristics of the group, such as income, age, family structure, occupation and psychological parameters, and not on the location of the group of the quality of facilities actually available or the actual means of access to them.

It would be most unusual, we feel, if there is any group in any origin zone whose demand is exactly met by the factors of access and quality factors outlined above. Combinations of these factors will lead groups in, say, urban locations to actually perform less of activities like hunting, for example, than their demand schedule would indicate. We shall term this actual amount they perform of various activities their participation schedule.

The major postulate leading from this concept is that we shall be able to evolve the participation schedule for each group in each origin zone from their demand schedule by specifically considering the actual opportunities for recreation available to residents of the zone, and by re-allocating or substituting accordingly among the various uses of

their leisure time. (The concepts of opportunity, substitution, and leisure-time budget are discussed separately, below.)

The term participation will be used with reference to zones of residence only. The purpose of this is to distinguish "participation" from its close relative, "consumption". We shall use the concept of consumption to refer to the transferred amount of participation from a zone of residence where people live to a zone where people recreate, even though this may be the same zone in some cases.

Consumption is thus a measure of actual user pressure on a destination zone, while participation is a measure of user pressure generated within an origin zone. In the whole system, total consumption must equal total participation, when summed over all origin-destination zones.

Demand, however, does not have to be equal to participation (or consumption), and as we have indicated, will seldom be so. This difference between demand and participation, due to imperfect access and/or lower quality of facility, will normally mean that participation is lower than demand. This will be so because most of our population is in urban areas, remote from the best recreational areas. We shall term this difference between demand and participation as latent participation which can be considered to represent an unsatisfied element of demand that would be converted to participation if somehow access to facilities and their quality were brought to the more ideal levels outlined earlier.

This is really the nub of the planning problem, for if a plan is devised to bring into production new recreational resources near urban areas, to improve their quality or means of access to them, more participation will result than could be expected from studies of population trends and characteristics alone. The provision of more or better recreational resources or improved access may induce actual participation from latent participation, and it is important for planners to know how much more participation would occur, and where it would appear as consumption.

The difference between demand and participation can also be such that participation in some activities exceeds the expected demand levels in some origin locations. In this case, we may say that an excess participation exists. This may occur, for example, in areas where the recreational resources for and access to some activities are "superb", and for others "poor". The participation in moose hunting, say, for residents of Kapuskasing may well exceed that implied by demand levels arrived at through consideration of the characteristics of the population. This may well be because their opportunities to go moose hunting are so high and at the same time their opportunities to engage in other leisure activities may be very low. In our terms, we postulate the substitution from other activities could induce a participation rate in excess of normal demand.

The implication of excess participation in planning is that if recreational resources were to be provided for alternative activities in the area, the participation rate in moose hunting might well drop, even

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        HIDES AND SKINS LEATHER
        1961-1982.
250(EDN)     2001$aREV. AND UPDA
265(SPB)     2001$a2
300(COL)     2001$aBK
740(AED) 00  2001$aRECUEIL DE ST
        CUIRS ET PEAUX BRUTS ET
        DE CUIR 1961-1982.
740(AED) 00  2002$aCOMPENDIO ES
        PIELES SIN CURTIR CUERC
        1961-1982.
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though nothing at all were done to change either the moose hunting resources or access. Again, the model could show the likely extent of the drop, as well as the level of provision of alternatives that would result in a given drop.

The concepts and postulates involved here can perhaps be summarized best by the following little bit of doggerel:

> Consider each population group, and
> Its characteristics give us <u>demand</u>.
> The people see if the <u>opportunity</u> is great,
> And they decide how they'll <u>participate</u>.
> Some is left over, called <u>latent participation</u>,
> Which the planner must watch for in each situation.
> The participants set out with the important assumption
> That when they finally get to their destination
> They'll find satisfaction in recreation <u>consumption</u>.

Motivation

The concept of <u>motivation</u> can be stated as "that process which furnishes an incentive or inducement to action". When the actions, however, are as varied in their nature as leisure and recreation activities, postulates and hypotheses must be formed from this concept with great care.

In general, we shall attempt to incorporate in this model two general postulates on motivation. The first will be that motivation, as

such, to engage in recreational activities, may have a certain overall level of intensity, which is dependent upon social, economic and psychological factors, but is essentially non-directed until a specific goal-set is considered. The second postulate is that a set of actual opportunities to conduct recreational activities, as "presented" to a specific group in a specific origin location in terms of a "map" of recreational resources and access routes to them, is in fact such a goal-set and will thereby channel their motivation along specific lines.

We may relate the above to the earlier remarks on demand/participation/consumption by visualizing non-directed motivation as yielding demand, and directed motivation as yielding participation and consumption.

In a sense, this concept of motivation may be seen as structuring a major portion of the model dealing with people's behaviour. This portion of the model is explained in greater detail in the section of the present report describing each block of the model. Yet there is a specific postulate which we propose for a separate model stage. This is the postulate that for all groups, the internal or subjective motivational potential to participate in the total repertoire of recreational activities can be represented by a demand schedule for recreational activities, including a relative indication of the degrees of preference. Later, we specify what concepts are implied in "activities", in discussing activities and activity/accommodation packages.

We could also postulate that a certain proportion of recreation

is motivated. Maslow in 1954 [1] admitted as a strong possibility that play (and recreation, presumably) as such is unmotivated, i.e. that play is an end and not a means. People do what they do because they like it.

The very fact that "I like it" means that I am positively disposed or oriented towards the object; and positive or negative feeling-states definitely motivate overt behaviour in one way or another.

We believe that it may not be so much in the play itself but in the manifestations or modes of conducting play activities, that motivation is to be sought. We are unable to propose that this latter idea be pursued at present, since we have so very few data on different types of experiences in what is usually defined as one activity, e.g. driving for pleasure in a sports car race versus driving for pleasure to see Christmas lights.

Socio-Economic Groups, Psychological Strata, Occupational Mix

Though the concept of considering a socio-economic group as a basic population unit is a simple one, frequently employed, it is nevertheless important for us to clarify what measures we propose to use in defining groups, and how the group data are to be used in the model.

We postulate that the variance of individual demand will be less among persons in groups defined by their age/family-structure and their family income (individual income, if single) than the variance between such groups. For this reason, a number of people in classifications of age and family structure (considered together) and income, are treated as

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1. A. H. Maslow, Motivation and Personality, Harper and Row, New York 1954 pg. 302.

a group. The groups shown below are examples of groups that could be dealt with in a model run. Operational considerations and groupings for the prototype are given in Section III.

Age/Family-Structure	INCOME LEVEL* AND 1969 FAMILY INCOME				
	Low 0-5,000	Med-Low 5-7,000	Medium 7-10,000	Medium-High 10-15,000	High over 15,000
Single, age 18 - 25					
Single 26-65 and married 18-65, no children under 18					
Single or married, 65 or over					
Married, pre-school children only					
Married, under 35, child(ren) 5-18					
Married, 35-44 child(ren) 5-18					
Married, 45-64 child(ren) 5-18					

For each origin zone, the appropriate population of each group will be determined. Each group will be assigned a demand schedule for recreation activities - a rank-ordered weighted preference-list based

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* Note that the concept of "high", "low", etc., incomes need not be tied to a specific number of dollars. This permits the functional concept of income as purchasing power to be expressed differently as the situation may require; e.g. $7,500 income in 1970 may be "medium" in most areas, but "medium-low" in Metro Toronto; the same amount may be "low" in 1990.

on socio-economic characteristics and on motivation factors imputed to the group. Each will also be assigned an appropriate schedule of leisure time periods available, i.e., a leisure-time budget (described later in this section).

When we are able to determine the basis for it, the concept of psychological strata could be employed to assign portions of each group to different demand schedules, appropriate to their psychological differences. For example, it may be the case that 50 per cent of married couples with pre-school children in a given urban area are apartment dwellers and that this life style correlates with a need to engage in activities outside the family group (as an escape from close quarters), more so than is true say, for house dwellers. We could then assign 50 per cent of the group a schedule which ranks the "loner" activities such as golf, tennis, etc., higher than activities such as camping, which tend to reinforce family "togetherness". Though we believe it to be unlikely that the present status of psychological knowledge will permit such hypotheses to be built into the prototype model, we nevertheless are convinced that it is important that the model be capable of handling hypotheses based on this concept of behaviour variation by psychological strata. We have made provision to incorporate this feature explicitly in the structure.

Similarily, the concept of the occupational mix of a given socio-economic group could be used in assigning a range of different leisure-time budgets to proportions of the group, depending on their tastes and the length of vacation, number of free weekends, etc., all of which are normally associated with occupation to some degree. Again, this is a case

where the concept will be built in, but operational hypotheses may not be tested in the prototype owing to the difficulty of projecting occupational data for future years.

Other concepts for group distinctions could be an urban/rural distinction or one based on ethnic groups. We have reluctantly discarded the concept of groupings considering ethnic differential. Though we believe that ethnic background is undoubtedly a strong and distinctive determinant of motivation and demand, we are unable either to project the numbers of persons by ethnic origin for future years, or to estimate with any reliability the proportion who may be considered "assimilated", and therefore non-ethnic in behaviour. We feel that the concept of a rural/urban distinction for behaviour of given socio-economic groups is incompletely supported by available evidence,* once the effects of opportunity and access are equalized as we have discussed earlier. Furthermore, what distinction there may be now will be greatly lessened in future by two factors; the declining rural farm population, and the behavioural homogeneity fostered by modern communications.

Activities, Activity Groups, Activity/Accommodation Package, Home-Based versus Non-Home-Based

The concept of a recreational activity is a relatively simple one, yet it must be explained as it pertains to our model. A recreational

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* Ben W. Crow and Associates Ltd., "A Study of the Leisure Needs and Activities of Canadians", September, 1969.

activity is some pursuit in which people participate during their leisure time, which implies a pattern of behaviour clearly distinguishable from those of other activities and which may require a distinctive environment in which to conduct the activity. We postulate that due to these distinctions, a distinctive motivational reason may underlie each specific activity.

The definition and enumeration of specific activities is another matter, and must always be made on a somewhat arbitrary basis according to the operational needs. For the purposes of the prototype model, we must restrict the definitional list of activities rather more than we might wish. For example, we shall eliminate scuba diving owing to lack of data; we shall be unable to distinguish between swimming in a pool versus swimming at a beach; and so forth. The complete list of activities is enumerated in Section III dealing with details of the model blocks.

Another concept has been found useful - the activity/accommodation package. The need for this concept becomes clear when the distinction is recognized between behaviour during short periods and during prolonged periods devoted to recreation. A short period in this sense is considered to be a day or part of a day, and hence the recreation may be said to be home-based and does not involve use of other accommodation.

In the case of home-based recreation, we postulate that recreational trips are made for a single activity-purpose at a time. That is, we will have a trip-distribution operation in the model for each activity defined in the model. Only day or part-day trips will be handled in this way.

When we come to consider the motivational basis for non-home-based recreation, which involves trips longer than one day, we believe that a single recreational activity usually is no longer dominant in the trip-making decision. We postulate that people say to themselves, "I am going to the cottage this weekend. When I get there I will swim, boat and play golf." We do not think that they say, "I wish to swim this weekend. Therefore, I will go to the cottage."

The accommodation involved in a prolonged trip seems in many, if not most cases to be a part of the recreational experience, along with several recreational activities. For this reason, we shall make use of the concept of a "package" of experiences, called an activity/accommodation package, to characterize recreational trips whose duration is longer than one day.

We postulate that the main determinant of decisions on recreation on occasions involving overnight or longer periods (which we refer to as non-home-based leisure periods) will be characterized by the accommodation used, e.g. cottage, camping, resort, etc. There are, however, significant sub-modes of recreating depending on the main activity desired in each case, and the consequent mix of other related activities which normally accompany the prime activity. For example, we would expect to find different activity patterns for people at a family resort on Lake Muskoka than that at a fishing lodge near Minaki. We expect to find different patterns of activities for wilderness campers versus those who prefer Pinery Provincial Park. The concept of activity/accommodation packages permits the distinction in activities people desire in these longer

periods (and hence in their choice of location and the relative weight they place on attraction of natural and man-made facilities), to be shown in more detail than if each accommodation type were not so subdivided. We believe this gives not only a better picture of the pressures that are exerted on the recreational resources of destination regions (e.g. boaters who are guests at resorts or who are cottage residents probably exert more pressure on the resources of most regions than persons who boat while on day-trips), but also a finer distinction on the motivational side, so that people's differences can be more closely represented.

Groups of people will be assigned rank-ordered preference lists, for example, for weekend and vacation preferences of these packages. Examples of such packages are: fishing at a fishing lodge, boating and camping at a Provincial Park, attending opera and staying at a hotel.

We shall, of course, have to restrict our modelling efforts to deal with a manageable number of packages. The number of possible permutations and combinations of activities and accommodation types is legion. Between five and ten packages will be chosen for implementation from the following (or combinations of them):

- seasonal dwelling unit, water-oriented
- seasonal dwelling unit, non-water-oriented
- camping, primary purpose
- camping, activity-oriented
- camping, touring

- commercial, activity-oriented, non-urban
- commercial, touring
- commercial, urban-oriented
- home of friends or relatives, social
- home of friends or relatives, touring
- accommodation not tied to a specific location (trailer, boat, etc).

We postulate that a trip distribution procedure will be carried out separately for each of the above. (Also a split will be made by season, and by duration of the trip, as is explained later in this section). It is unlikely that we will be able to simulate point-to-point touring movements with the model.

Two important things must be added to the above discussion. The first is that the activity categories defined should cover the whole spectrum of leisure activities that may be conducted in any group's leisure time. That is, there will be a residual category of recreation which takes place entirely in the home, such as TV, hobbies, reading, etc. The second is that there will also be a category, or more than one perhaps, for recreation which takes place within the urban community. This segment of recreation might be referred to as "urban activities", but in our model we shall use this term to mean only those leisure activities which require urban facilities - for example concerts, museums, etc. - of a specialized nature, with perhaps another category for all those requiring general urban facilities such as shopping, restaurants, etc. Activities such as swimming

or walking for pleasure which take place within the group's own community will be covered under the normal activity range as cases where the destination zone coincides with the origin zone. It should be noted that the size of the zones presently proposed will mask the location of where activities take place within, say, an urban-centered county. There is no reason other than availability of data at a finer level, such as townships or urban zones, that the model could not eventually display such effects.

Leisure-Time Budget; Time Quanta; Seasonality

In some analyses, the concept of a leisure-time budget is interpreted as a number of hours, perhaps in a year, which is available for discretionary use. In our model, a leisure-time budget for a group will consist of a schedule giving specific numbers of periods of the following types, called time quanta, that are discretionary over the period for which the model is run:

- number of part-days
- number of whole days
- number of "weekend" periods* (periods of 2 or 3 days, including 1 to 3 nights)
- number and length of vacation periods (periods longer than 3 days).

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* Note that we use the word "weekend" to denote only the weekly "sabbatical" which for some occupations may occur during mid-week. We will provide capability in the model to keep track of whether these weekend quanta fall on weekends or not, in order to measure the peaking phenomenon.

The first two of the above categories represent home-based recreation, and we postulate that these should be run separately in the model, on a single-activity basis. In fact, however, it may prove impractical to model the part-day periods at the prototype stage. The latter two categories represent non-home-based recreation, for which we postulate runs on the basis of activity/accommodation packages. Weekend-length and vacation-length periods will be run separately, because of the different characteristics of travel and opportunity in each case.

Once non-home-based trips are allotted to a destination zone by the model, we propose to apply a conversion procedure which will impute a schedule of single recreation activities to each type of activity/accommodation package. This will assign visitors using different accommodation types in each zone an appropriate equivalent amount of consumption of "daily" recreational activities, tied in with some key activity in their activity/accommodation package. This will be necessary so that we can get a full picture of activities pressures for each zone. Conceptually this will be somewhat as though the persons arriving at the zone were engaging in "home-based" activities with their origin now transferred to the destination zone in which they find their accommodation. Account will also be kept of the relevant lodging used.

The model could be run over any single period in a year. In this case, no factors of <u>seasonality</u> would be apparent. We could, on the other hand, propose that the model be run for, say, quarterly periods, in

which case the regular four seasons would be defined. Or, it could be the case that a two-season model will be most effective, broken broadly into cold-season/warm-season periods. This will ensure that the major dichotomy both in behavioural patterns and in resource-use patterns will be considered, and will avoid the extra problem of acquiring data for the "mid" season of spring and fall.

Substitution

The concept of substitution may be considered as the process by which replacement takes place of:

- one activity for another activity (same time-quantum, same location)
- one time-quantum for another time-quantum (same activity, same location)
- one location for another location (same activity, same time-quantum)

We postulate that in the model, the last process of substitution above will be represented by the choice of destination permitted for any given recreational trip in the distribution operations of the model (see below for the "distribution" concept).

The process of substitution of one time-period for another is seen as a hierarchial one, depending on the "match" between the desires or demands of a group and the recreational opportunities available in their zone of residence. The postulate is, if a person is already living in a "recreational paradise" he will have less need to make non-home-based trips, and will tend to allocate some of the time that he may have available

in prolonged quanta to a series of shorter trips. We must admit the possibility of taking several short one- or two-day trips, or also day or part-day trips, during a "vacation" period for example, or of only day or part-day trips being taken during the weekend. Specific model blocks assessing this match and the mechanism for time shifting are described in Section III dealing with details of model blocks.

Several problems arise in arriving at postulates for substituting one activity for another. There are grounds for stating that certain activities, say, water-skiing, have no substitutes, and if people do not have the opportunity to do them, they will not then take up, say, golf. Nevertheless, we can postulate that when participation in the most favoured home-based activity is constrained due to relative lack of opportunity, that some of the daily time-quanta represented in demand for the activity will fall into the residual (or "in-home") category and some will be reallocated to other activities, presumably on a basis proportionate to the rest of the preference weights. An analogous postulate can be proposed for reallocation of the longer-period non-home-based activity/accommodation packages downward through the preference list, if constraints of opportunity are encountered.

Life-Space; Supply;
Access; Opportunities

The concept of life-space in the model refers to some geographic area centered on the zone of origin of a given group. It is a space whose radius is a function of their travel resistance varying with the time quantum considered, and represents the normal "striking-radius" or action-radius of that group during a leisure period of the appropriate length.

The postulates resulting from this concept imply that consideration should be given to the repertoire of activities that can be conducted, say, within the daily life-space of the given group, when we wish to determine how much of their demand for daily-period activities will be reflected in actual participation.

We propose to construct a set of opportunity indices which will describe how the supply of recreational resources in all zones is modified by their attractive qualities (see below for "attraction") and the access to these resources from all other zones, as measured by time-distance. For each activity, a, and for each origin zone, i, we shall then compute an index which reflects both the supply of recreational resources for that activity in all zones and the relative ease of access to them. Since this index will represent a measure of ability to participate, in the sense of being able to get at a resource, we call it an opportunity index for participating in activity a from zone i.

The concept of opportunity, therefore, implies both the existence of a recreational resource and the possibility of getting to it, and we propose that it can be expressed in an index such as mentioned above. If the opportunity index for activity a from zone i is relatively low compared to other activities, then participation in a by people in zone i will be lower than demand, even though the people may tend to take as many longer trips as they can which involve activity a.

We can extend the daily life-space concept to the longer-range weekend or vacation life-space, to consider how far and for what range of activity/accommodation packages people will travel within these time periods. Conceptually, the travel resistances defining the size of the life-spaces may be made functions of income and leisure-time available.

Attraction; Distribution

The concept of recreational attraction can be thought of as a quantitative measure of those qualities of an environment that induce pleasure and/or satisfaction in its recreational users. This is in many ways a function of the perception users have of specific attributes of the environment. We can all think of locales where we would swim, say, only if we had no alternative place to go swimming, and others for which we would make a lengthy trip or detour. Our problem in the model is that such measures must be arrived at for each activity and activity/accommodation package, on a basis of aggregating the quality for each whole zone. In the prototype model, we postulate that these will be a function, in most cases, of simple measures of the quantity or capacity, quality, cost and variety of facilities for the activity in each zone. It would also be possible to make this attraction function vary according to the socio-economic group being considered.

We have seen earlier how the model will have to derive numbers of persons from each origin zone who remain in their own zone or who take trips of various durations and for various recreational purposes.

We termed these numbers participation. The model must also perform the operation of finding out where any resulting trips go; i.e., to which destination zones. This process is termed distribution, and the concept is well known in urban traffic modelling. Distribution will convert our participation into consumption, as defined earlier.

Our postulate regarding distribution is that a gravity type model will be applicable, with the attraction indices used to represent the "pulling power" of the various destinations for specific kinds of recreational trips (home-based and non-home-based).

Resident Versus Non-Resident Models

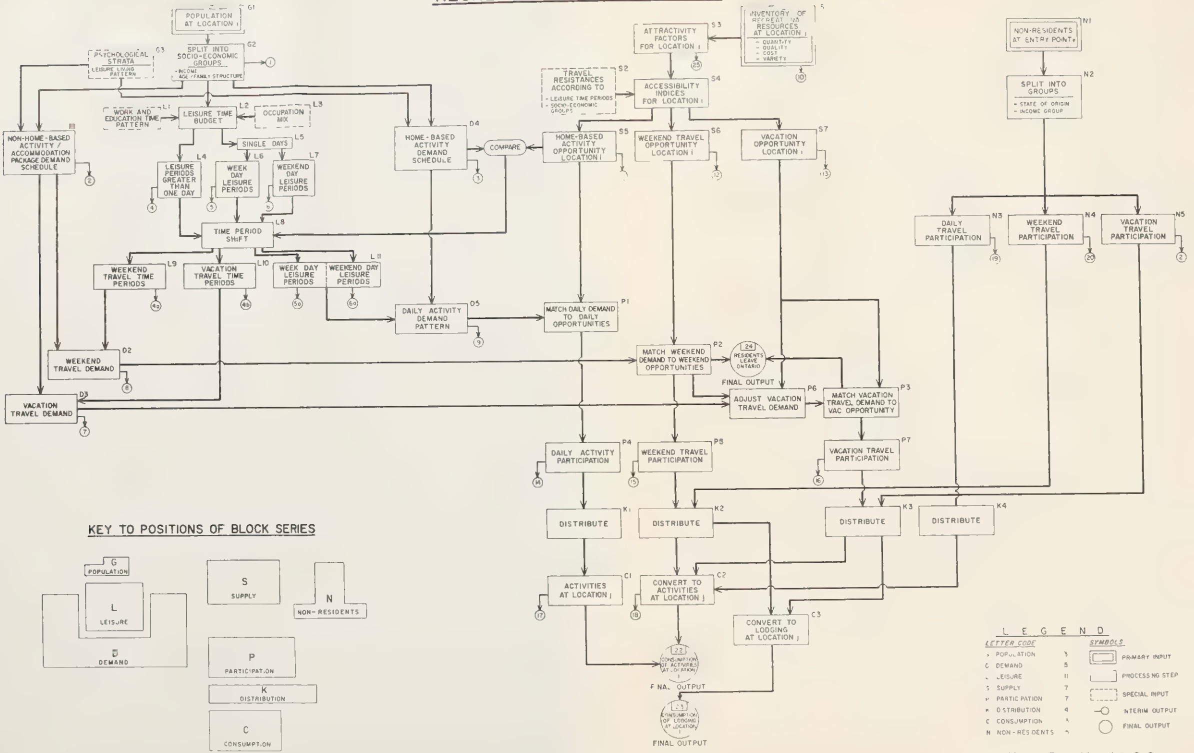
All of the above discussion may be deemed pertinent to the problem of determining how residents of Ontario behave vis-a-vis the recreation systems of Ontario.

A somewhat different operational concept will be necessary to handle non-residents of the Province. The main difference will be that for non-residents, only the participation and consumption phenomena can be dealt with. We shall be unable to handle demand and its motivational basis for them because of the tremendous scope of the problem and lack of data to tackle it.

The operational procedure will be to segregate visitors to the Province by point of entry and by length of stay of recreational visit. As a first approximation it will be possible to deal with these visitors as increments of participation in the origin zone containing

the entry point for trips of the relevant duration and type. The same sections of the model which check opportunities and distribute trips will be deemed to apply. Once arrived at a destination zone within Ontario, non-residents will have the same rules for allocation to activities and to accommodation types applied to them. A much better way to handle non-residents would be to set up a number of external zones in the model. We suggest that this be considered as one of the steps for intermediate refinement of the model. We avoided it now due to program complexity and lack of data. Ultimately, all of North America, or even beyond, could be covered by means of such zones as the required data is identified or becomes available.

RECREATION DEMAND MODEL



Kates, Peat, Marwick & Co.

III - DETAILED MODEL STRUCTURE

This section presents a detailed description of the recreation demand model system and its component parts. The level of detail is consistent with the development of the model hypotheses as they now exist. Because of the technical nature of this section and the extent of detail in which the component parts are described, it may be skimmed quickly on a first reading of the report. Descriptions of several of the key blocks are augmented by a simplified hypothetical example showing in numerical terms, how the block will operate.

The basic components of the model and the system of inter-relationships were shown earlier in Section I as a generalized model flow diagram (Figure I-1). The detailed model structure shown in Figure III-1, opposite, consists of 46 different blocks, some of which could themselves, be considered as individual sub-models. Each block is coded on the chart according to the basic model component in which it belongs (e.g. blocks with prefix S belong to the supply component of the model).

Each block is discussed according to the following major headings where relevant:

- function of the block
- input categories and sources
- output to other blocks
- optional output to the user
- calibration - general
- calibration - prototype.

We are dealing in this report with both the overall model framework and concepts, and the feasibility of developing a working prototype model within this framework. Consequently, the calibration of the model has been dealt with, for each block of the model where relevant, according to two points of view. First, under calibration - general, the general process and data requirements are discussed; and then under calibration - prototype, the method of approaching the calibration process by using existing data sources is discussed.

During the development of the prototype model, calibration will be largely a trial and error process whereby various adjustments will be made to the parameters, functional relationships and computational procedures, until some degree of agreement is reached between the behaviour of the model and the real-life recreational patterns that can be measured by available data. Data required for calibration of the prototype model falls into two broad categories. First there is the "hard" data covering the characteristics of people including demographic and socio-economic factors. Other data in this category relate to the inventory of recreational resources and facilities with descriptions of capacity, quality and geographic location. Generally, available data in this first category is satisfactory for the prototype model. Further data needed, on recreational activity preferences and leisure time budgets, will be estimated or imputed as discussed later in this section.

The other class is one of "soft" data containing information which would include the characteristics of activity substitution, travel resistance and the relative importance of quality, cost, etc. on the

choice of recreational activities. Data within this class is almost totally lacking. However, attempts will be made to develop reasonable estimates of these relationships during the trial and error process of model calibration mentioned above.

In many blocks of the model, no calibration process is actually required. These blocks may be registers for accumulating interim data in the model process or they may be strictly computational blocks that do not require calibration to a set of parameters.

For the purpose of illustrating the concepts involved in the more important blocks of the model, numerical examples have been developed and included throughout the section. The numerical values used in the example are intended to be realistic for the most part, although not necessarily accurate. As the prototype model evolves and the logic is worked out in more detail, some of the computational procedures demonstrated in the numerical examples may be modified.

The descriptions of the individual model blocks have been arranged within this section in a logical sequence to enable the reader to get through the entire model description with a minimum of difficulty. Reference should be made to the detailed model flow chart shown in Figure III-1 to obtain an understanding of the inter-relationships of each model block with the overall structure.

G1 Population at Location i

Location i (County)	Population			
	1966	1971	1980	2000
1. Algoma	120,000	134,000	160,000	240,000
2. Brant	112,000	123,000	147,000	216,000
3. Bruce	40,000	44,000	53,000	75,000
.	.	.	.	.
54. .	.	.	.	.
55. .	.	.	.	.
Total	7,000,000	7,800,000	8,600,000	11,000,00

BLOCK G1 Population at Location i

FUNCTION

This block is the basic file of demographic data on Ontario residents for input to the operation of the model. Resident data is organized so as to provide the number of people residing in each of the zones into which the province has been divided.

INPUT CATEGORIES AND SOURCES

The basic input data is derived from the Census of Canada. The data categories and geographical units have, therefore, been made compatible with this source. When the model is operated for a future year, estimates of population by category and geographic unit must be provided externally.

The base year for assembling population data and calibrating the prototype will be 1966.

The zones will consist mainly of counties in Southern Ontario and districts in Northern Ontario. Several of the counties around Metropolitan Toronto may be split into two or more parts, giving a total of 55 zones for the prototypes model. A numerical example appears opposite.

OUTPUT TO OTHER BLOCKS

This block feeds information to block G2.

BLOCK G2 Socio-economic Groupings

FUNCTION

This block acts as a register for the aggregated demographic data supplied to it from Block G1. The total population of each zone is stratified into a number of compartments according to the two most significant variables of outdoor recreation behaviour:

- total household income
- age/family-structure.

INPUT CATEGORIES AND SOURCES

Operation of this block requires the breakdown of population for the base year according to the socio-economic groups selected. For the two most important variables of stratification the breakdown might be as follows:

A Household Income

1. ------ \$ 0 - 4,999
2. ------ \$ 5,000 - 6,999
3. ------ \$ 7,000 - 9,999
4. ------ \$10,000 - 14,999
5. ------ \$15,000 and over

B Age/Family Structure

1. Single 18 - 25.
2. Single 26 - 65 and married 18 - 65, no children under 18.
3. Married, pre-school children only.

4. Married, at least one child 5 - 18, age of head less than 36.

5. Married, at least one child 5 - 18, age of head 36 to 45.

6. Married, at least one child 5 - 18, age of head 46 to 65.

7. Married or single over 65.

The model may, of course, be refined still further at any time by the breaking down of population into additional groups. The model itself would not have to be changed for this to be done; only the appropriate population data file would have to be provided.

For operating the prototype it is not meaningful to have too fine a stratification of population because the data currently available does not support it. Categories recommended are:

A <u>Family Income</u>

1. Low ------ $ 0 - 4,999
2. Middle ------ $ 5,000 - 9,999
3. High ------ $10,000 and over

B <u>Age/Family Structure</u>

1. Single, 18 - 25.

2. Single, 26 - 65 and married 18 - 65, no children under 18.

3. Married, pre-school children only.

4. Married, at least one child 5 - 18, age of head under 66.

5. Married or single, over 65.

G2

Socio-economic Groupings

Location 2 (Brant County) 1966

Age/Family Structure

Income	Single 18-25	Single 26-65 Married 18-65 No Children	Married Pre-School Only	Married under 66 with child	Married or single Over 65
Low	7,000 / 7,000	10,000 / 7,000	10,000 / 3,500	7,000 / 1,800	5,500 / 4,000
Middle	3,500 / 3,500	25,000 / 20,000	6,000 / 2,500	15,000 / 3,700	4,000 / 3,000
High	500 / 500	4,000 / 3,000	1,000 / 300	12,000 / 3,000	1,500 / 1,000

No. of People / No. of group units

The number of group units is the total number of families and unrelated individuals in the category.

Kates, Peat, Marwick & Co.

The above classes would give a maximum of fifteen population compartments for the prototype model.

A provision will be available in the general model structure to modify the income levels specified above according to variations in the cost of living in the various zones of residence. However, this provision will not be incorporated in the prototype. A numerical example for a typical zone of residence appears opposite.

OUTPUT TO OTHER BLOCKS

This block provides the basic categories and number of population by category to the demand section and leisure-time section of the model.

OPTIONAL OUTPUT (Reference 1 on Chart)

The total population and/or number of family units by socio-economic group and by zone of residence can be output from this block.

BLOCK G3 Psychological Strata

FUNCTION

This is not an operations block but a special input to provide information on psychological factors, leisure living patterns and life styles, for the purpose of assisting in the formulation of activity demand schedules for each of the socio-economic groups of Block G2.

These psychological factors themselves will not be used as a means of developing a major stratification of population. The major strata will remain income and age/family structure.

OUTPUT TO OTHER BLOCKS

This block supplies information to Block D1 and Block D4.

CALIBRATION - GENERAL

Few sources are available for obtaining insight into the various psychological factors that may change the preference scale for members of a basic socio-economic group. One of the sources is the Ben Crow Survey.* This uses a 7-point rating scale to measure satisfaction/unsatisfaction on a sample of the Canadian population, and attempts to discover unfilled needs for travel-recreational activities.

Motivation is also related to what may be called social incentives producing a cluster of behavioural patterns that are characteristic of certain groups of people. Environmental characteristics of recreational

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* Ben W. Crow and Associates, Ltd. "A Study of Leisure Needs and Activities of Canadians", September 1969.

locations provide another source of incentives for recreational - travelling activities.

Calibration of the model will involve quantification of some of these more important factors in order to produce preferred activity schedules for various categories of population.

CALIBRATION - PROTOTYPE

This block will not be calibrated in the prototype.

BLOCK D1 Non-home-based Demand Schedule

FUNCTION

The purpose of this block is to provide, for each socio-economic group, a list of preferred activity/accommodation packages to indicate the relative demand for each of the packages. The preferred list is expressed in terms of the percentage of total leisure time in this category for a particular socio-economic group, that the group would desire to allocate to each of the activity/accommodation packages, if opportunity and access were unconstrained. The demand schedules will be the same irrespective of location of zone of residence.

By definition, non-home-based outdoor recreation activities involve some form of overnight accommodation away from home. The form of accommodation could fall in one of five classes as follows:

1. Seasonal dwelling (cottage, farm, etc.).
2. Commercial establishment (excluding commercial campsite).
3. Campsite (public, quasi-public and commercial).
4. Home of friends or relatives.
5. Other accommodation not tied to a specific location (trailers, boats, etc.).

A trip involving overnight accommodation is usually associated with more than a single outdoor recreation activity. For this reason, it was thought convenient to express the demand for this class of outdoor recreation in terms of a total "package".

INPUT CATEGORIES AND SOURCES

Input data and categories are those supplied to it from Block G2. Additional information comes from Block G3.

OUTPUT TO OTHER BLOCKS

This block feeds Block D2 and D3 which compute total extended-period travel demand.

OPTIONAL OUTPUT (Reference 2 on Chart)

The amount of weekend and vacation user activities demand for the population in each zone of residence expressed on a percentage basis for all activity/accommodation packages.

CALIBRATION - GENERAL

The calibration of this block involves the determination of the appropriate activity/accommodation package schedules for each socio-economic group based on the analysis of psychological and other motivating factors.

CALIBRATION - PROTOTYPE

The determination of the demand schedules will be made on the basis of currently available published reports such as the Canadian Ben Crow study and the U.S. Bureau of Outdoor Recreation survey reports.

The activity/accommodation packages selected for inclusion in the prototype model are the following:

D1 Non-Home-Based Activity Demand Schedule

Example: Season: summer
Age/Family structure: Married under age 66, with children
Income: Middle

Activity/Accommodation Package	% Preferred Weekend Period	% Preferred Vocation Period
1. Seasonal dwelling - water-oriented	29	19
2. Seasonal dwelling - non-water-oriented	4	5
3. Camping - primary purpose	6	3
4. Camping - activity-oriented	8	7
5. Camping - touring	2	7
6. Commercial - activity-oriented, non-urban	6	10
7. Commercial - touring	3	10
8. Commercial - urban oriented	4	5
9. Friends or relatives - social	23	7
10. Friends or relatives - touring	10	21
11. Accommodation not location specific	5	6
	100%	100%

- seasonal dwelling - water-oriented
- seasonal dwelling - non-water-oriented
- camping - primary purpose
- camping - activity-oriented
- camping - touring
- commercial - activity-oriented, non-urban
- commercial - touring
- commercial - urban-oriented
- friends or relatives - social
- friends or relatives - touring
- accommodation not location specific.

This list could be greatly expanded for the development of a refined model. For example, no distinction has been made on the above list between the usage of trailers and the usage of tents for camping.

An example of a typical non-home-based activity demand schedule for use in the prototype model appears <u>opposite</u>.

BLOCK D4 Home-based Demand Schedule

FUNCTION

The purpose of this block is to provide a schedule of preferred activities for each socio-economic group and to indicate a demand for each of the more significant outdoor recreation activities in which participation can take place on a daily basis from home. The preferred schedule will be arrived at by assuming no constraints on opportunity or access.

These home-based outdoor recreation activities can be performed in various places and in various time periods throughout the week. The places where these activities can be engaged in are as follows:

- at home (e.g. own backyard)
- own neighbourhood (within walking distance)
- elsewhere within the same residential zone
- another zone within a single-day distance from home.

The preferred activity list is weighted in terms of a percentage of daily leisure-time for a particular socio-economic group that would be allocated by this group to each of the activities, in the absence of constraint on opportunity and accessibility.

Since the model is essentially a single season model that can be run for any season of the year, it is necessary to have activity lists that pertain to the season of the year for which the model is being run.

The different times of the week in which home-based activities can take place are the following:

- daily, week-day (all day)
- daily, weekend day
- daily, partial week-day (after work/school).

Daily home-based activities can also be engaged in during vacation periods. The first category above would include statutory holidays that occurred in mid-week and would include days off work in certain occupation classes where the normal weekly two-day period off work does not occur on Saturday or Sunday.

INPUT CATEGORIES AND SOURCES

Input data and categories are those supplied from Block G2. Additional information comes from Block G3.

OUTPUT TO OTHER BLOCKS

This block feeds Block D5 which computes total daily activity demand. It also feeds a comparison operator that compares the daily activity demand with the daily opportunities in order to provide for a time-period shift in Block L8.

OPTIONAL OUTPUT (Reference 3 on Chart)

The amount of daily user activity demand for the population in each zone of residence expressed on a percentage basis for all activities.

CALIBRATION - GENERAL

As in Block D1, the calibration of this block involves the determination of the appropriate single-activity schedules for each socio-economic group based on psychological and other motivating factors.

The model may be calibrated and run for any given season once it is supplied with the appropriate list of activities desired and leisure-time periods available for that season.

A useful application of the model would be to determine accommodation peaking characteristics related to outdoor recreation demand. This would be accomplished if the model were run for an average summer weekend, possibly, followed by another run of the model for an average winter weekend. Proceeding in this manner, it is then possible to estimate year-round demand.

CALIBRATION - PROTOTYPE

The determination of the demand schedule will be made on the basis of currently available published reports such as the Canadian Ben Crow Study and the U.S. Bureau of Outdoor Recreation survey reports.

Although each of the categories of places where daily activities can be performed, in the above list, is important, the prototype model will probably have to be restricted to dealing with allocation of activities in the last two categories.

For the time-of-week categories, the prototype model will not

deal with Category 3 which is daily, partial week-day (after work/school).

For the prototype model, two sets of activities could be developed, one for the summer season and one for the winter season. Lists for the most significant activities for each of the two seasons are the following:

	SUMMER SEASON	WINTER SEASON
1.	Driving for pleasure	Driving for pleasure
2.	Walking for pleasure	Walking for pleasure
3.	Hiking	Hiking, Snowmobiling
4.	Swimming	Swimming
5.	Boating - row - canoe - sail - motor	Snowmobiling
6.	Water skiing	Skiing
7.	Fishing	Fishing
8.	Hunting	Hunting
9.	Picnicing	
10.	Outdoor team sports - football - baseball - etc.	Outdoor team sports - hockey - etc.
11.	Outdoor individual sports - golf - tennis - etc.	Outdoor individual sports - skating - etc.
12.	Indoor sports	Indoor sports

D4 **Home-Based Activity Demand Schedule**

Example: Season: Summer
Age/Family Structure: Married under 66 with children
Income: Middle

Activity	% Allocation of Home-Based Leisure Time
1. Driving for pleasure	15
2. Walking for pleasure	7
3. Hiking	3
4. Swimming	6
5. Boating	7
6. Water Skiing	2
7. Fishing	3
8. Hunting	1
9. Picnicing	6
10. Outdoor Team Sports	4
11. Outdoor Individual sports	6
12. Indoor sports	3
13. Historical, cultural and urban (intensive)	7
14. Urban and Cultural (general)	4
15. Residual leisure	26
	100%

	SUMMER SEASON	WINTER SEASON
13.	Historical, cultural and urban (intensive)	Historical, cultural and urban (intensive)
14.	Urban and cultural (general)	Urban, cultural (general)
15.	Residual leisure	Residual leisure

An example of a typical home-based activity demand schedule for use in the prototype model appears opposite.

BLOCK L1 Work and Education Time Pattern

FUNCTION

This is not an operational block but a special input to the leisure-time budget Block L2.

Two major factors that determine when leisure time is available for participation in outdoor recreation activities are the distribution of time spent at work and the time spent at school throughout the year. The length of the work day, the work week and the characteristics of the annual vacation period or periods are also important in determining leisure-time periods available for outdoor recreation. Similarly, characteristics of the school year are important, particularly for families with school-age children.

This block will allow the model to be run under different assumptions of work and education time patterns for future years.

This block will not be made operational in the prototype model.

BLOCK L2 Leisure-Time Budget

FUNCTION

This block will produce a schedule showing the number and mix of the appropriate total leisure-time periods available for each of the socio-economic groups fed to it from Block G2, under the assumption of work and education time patterns from Block L1 and occupation classes from Block L3.

INPUT CATEGORIES AND SOURCES

The input categories are those specified for Block G2 and are supplied to it from G2.

OUTPUT TO OTHER BLOCKS

Provides two basic outputs - the number of leisure periods greater than one day in various length categories such as weekend, one week, two weeks, etc., and the number of single day leisure periods.

CALIBRATION - GENERAL

No actual calibration is involved in this block. What is required is detailed knowledge about leisure-time budgets and how they vary according to age/family structures, income, occupation and other categories. Very little information is available in the literature on this subject. Most factual data would have to be derived from new surveys.

Leisure-Time Budget

Example: Location 2 (Brant County)
Summer season
Income: Middle
A/F structure: Married pre-school children only
Persons: 6,000
Group Units: 2,500

	Length of season	13 weeks	or	90 days
1.	Average vacation	1.7 weeks	or	10 days
2.	Average weekend periods away from home	5		10 days
3.	Average weekends at home	7		14 days
4.	Average straight daily periods	22		22 days
				56 days

Week-day days	22	x	6,000	=	132,000	person days
	22	x	2,500	=	55,000	group unit days
Weekend days	14	x	6,000	=	84,000	person days
	14	x	2,500	=	26,000	group unit days
Total Daily					216,000	person days
					81,000	group unit days
Weekend Periods	10	x	6,000	=	60,000	person days
	10	x	2,500	=	25,000	group unit days
Vacation periods	10	x	6,000	=	60,000	person days
	10	x	2,500	=	25,000	group unit days
Total Extended period					120,000	person days
					50,000	group unit days

CALIBRATION - PROTOTYPE

An imputed set of leisure-time budgets will be postulated on the basis of judgement for the development of the prototype model for each of the socio-economic categories defined in Block G2. An example of such a leisure-time budget for a typical zone of residence is shown opposite.

BLOCK L3 Occupation Mix

FUNCTION

This is a special input to the leisure-time budget Block L2. Its purpose is to provide an indication of the various occupation classes in the different socio-economic groups so that the appropriate mix of leisure-time budgets can be developed in Block L2.

This block will not be operational in the prototype model.

BLOCK L4 Leisure-periods Greater than One Day

FUNCTION

This block is a register which contains the total number of person and/or family leisure-periods by socio-economic groups in the various length categories of leisure-periods greater than one day described in Block L2.

INPUT CATEGORIES AND SOURCES

Input from Block L2.

OUTPUT TO OTHER BLOCKS

Output to time period shift Block L8.

OPTIONAL OUTPUT (Reference 4 on Chart)

The number of person and/or family leisure-periods in the various length categories greater than one day, for each zone of residence.

BLOCK L5 Single-Day Leisure-Periods

FUNCTION

This block is a register containing the total number of person-day leisure-periods by socio-economic group for all single-day leisure-periods.

INPUT CATEGORIES AND SOURCES

Input from Block L2.

OUTPUT TO OTHER BLOCKS

Output to Blocks L6 and L7.

BLOCK L6 Weekday Leisure-Periods

FUNCTION

This block is a register containing the number of single-day leisure-periods fed to it from Block L5 that occur on weekdays. This would include a certain proportion of those occupation classes which do not have a normal Saturday and Sunday weekend, as well as persons spending an annual vacation at home.

INPUT CATEGORIES AND SOURCES

Input from Block L5.

OUTPUT TO OTHER BLOCKS

Output to time period shift Block L8.

OPTIONAL OUTPUT (Reference 5 on Chart)

The number of person-day leisure-periods of one day occurring on a weekday in each zone of residence.

BLOCK L7 Weekend-day Leisure-periods

FUNCTION

This block is a register containing the number of single-day leisure-periods fed to it from Block L5 that occur on weekend days.

INPUT CATEGORIES AND SOURCES

Input from Block L5.

OUTPUT TO OTHER BLOCKS

Output to time period shift Block L8.

OPTIONAL OUTPUT (Reference 6 on Chart)

The number of person-day leisure-periods of one day occurring on a weekend day in each zone of residence.

BLOCK S1 Inventory of Recreational Resources at Location j

FUNCTION

This block provides an inventory of developed recreational resources for all outdoor recreation activities in each zone of the Province. The inventory is to be developed by seasons of the year for each of the two major classes of activities - that is, one class consisting of the various individual recreational activities and the other class consisting of groups of activities combined with a type of accommodation unit, called activity/accommodation packages.

For individual activities it is important to have in the inventory an indication of capacity for that activity, aggregated over the whole zone. This could be measured as an amount or size of the facility, if applicable, expressed in recreation days, or in some indirect measure such as acres, etc. In addition, it is necessary to know the relative quality of the supply of this activity in the zone as compared to other zones, the relative cost as compared to other zones, and a measure of the variety and complementarity with other activities in the zone. The quality measure could be obtained in some cases from objective measures, such as lift and run lengths for skiing, or from subjective assessments of the relative environmental quality of the zones pertaining to some more diffused activity such as hunting, picnicing, or driving for pleasure.

The important consideration in the inventory of supply for activity/accommodation packages is the number of accommodation units

available. The five basic types of accommodation are:

- seasonal dwelling
- commercial establishment
- campsite
- home of friend or relative
- other accommodation not tied to a specific location (trailer, boat, etc.).

The amount of accommodation available is fairly easy to determine on a zonal basis for each of the first three classes of accommodation. For the fourth class, the amount of accommodation will be proportional to the total population of the zone. The fifth class, which is not tied to a specific location, will have to be handled less precisely through a proportional allocation to zones where these types of opportunities are readily available (e.g. zones with large amounts of crown lands and public waterways, etc.).

INPUT CATEGORIES AND SOURCES

The categories of supply for the inventory correspond to the individual activities described in demand Block D4 and the activity/accommodation groups described in demand Block D1. The information would be obtained from a variety of federal, provincial and other inventories as well as directly from the individual participating departments of the Government of Ontario.

OUTPUT TO OTHER BLOCKS

This block provides the basic information required to cal-

culate zonal attractivity factors in Block S3.

<u>OPTIONAL OUTPUT</u> (Reference 10 on Chart)

A summary of recreation resources by each of the characteristic categories may be printed out for each zone of the province.

CALIBRATION - GENERAL

For all the activities and activity/accommodation groups defined in Blocks D1 and D4, it is necessary to have for each zone, measures of quantity of the activity available (where applicable), its relative cost, relative quality and a measure for the variety of activities available. The zones of supply could be based on any zoning system desired, not necessarily related to the zones of residence, but they must be zones for which the required data are available and could be summarized for input to the model. All data would correspond to the base year for which the model is being calibrated.

CALIBRATED - PROTOTYPE

It is recommended that the base year for assembling outdoor recreation supply data and calibrating the prototype be 1966.

It has been suggested that the zones of supply should be compatible with county boundaries. Therefore, it is recommended for the prototype that the zones of supply be identical to the zones of residence. These zones consist mainly of counties in Southern Ontario and districts in Northern Ontario giving a total of 55 zones of supply for the prototype model.

S1 Inventory of Recreational Resources by Location j

Example: Location 37 (Peterborough County)
Summer season

	Quantity	Quality	Cost	Variety and Complementarity Factor
Class I - Single Activities				
1. Driving for pleasure	1.0	.7	1.0	.7
2. Walking for pleasure	1.0	.6	1.0	.8
3. Hiking	200	.7	1.0	.7
4. Swimming	500	.9	1.0	.8
5. Boating	600	.8	1.0	.8
6. Water Skiing	25	.9	1.0	.8
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
Class II - Activity/ Accommodation Package				
1. Seasonal dwelling-water oriented	14,307	.9	0.3	.8
2. Seasonal dwelling-non-water oriented	286	.7	0.5	.8
3. Camping-primary purpose	1,400	.9	0.7	.8
.				
.				
.				
11.				

Provision will be available in the general model structure for expanding the range of characteristics for the recreational resources so that they may vary according to different socio-economic groups. However, this provision will not be incorporated in the prototype.

The supply of recreational resources will be related to the single activities described in Block D4 and the activity/accommodation package types described in Block D1.

A numerical example of an inventory for a typical zone is shown opposite. Note that for particular activities where the quantity of the activity resource available or any other characteristics of the activity is not relevant, the numerical value 1.0 has been inserted in the table for convenience.

BLOCK S3 Attractivity Factors

FUNCTION

This block calculates measures of attractivity for each zone of recreational opportunity, specific to each separate activity and each separate activity/accommodation package.

In order to combine all of the attributes of a zone for a particular activity, it is necessary to derive appropriate weights for the relative values of quality, cost, and variety as obtained from the inventory of facilities in Block S1. Mathematically, this would be expressed as follows:

$$AT_j^a = Q_a \times f\ (q_a,\ C_a,\ v\ ).$$

where:

AT_j^a = the attractivity for activity a in zone j.

Q_a = the total quantity of facilities available for activity a in zone j.

q_a = some aggregate measure of the quality of supply of activity a in zone j.

C_a = relative cost of activity a in zone j.

v = a relative measure of the variety and complementarity to other activities in zone j.

f is function that combines the various attributes q_a, C_a and v.

INPUT CATEGORIES AND SOURCES

Input categories are identical to those specified in Block S1 and all data comes from Block S1.

OUTPUT TO OTHER BLOCKS

The block feeds Block S4 for computing accessibilities and also feeds (not shown on the chart) Blocks K1, K2, K3 and K4 which assign activity participation of people living in a zone of residence to consumption in a zone of recreational opportunity through a process of distribution.

OPTIONAL OUTPUT (Reference 25 on Chart)

A summary of attractivities by zone for each separate activity and each separate activity/accommodation package.

CALIBRATION - GENERAL

Calibration of this block involves the determination of the function f in the above expression which combines values of relative quality, cost and variety of activities with appropriate weights that produce a relative attractivity of each zone for each activity. Most information for this would have to come from new surveys which could then be analyzed using non-parametric statistical techniques such as factor analysis, etc.

CALIBRATION - PROTOTYPE

Published data from all available sources and our best judge-

Attractivity Factors

For the prototype model, assume the attractivity function is linear:

$$AT_j^a = Q_a \times (w_1 q_a + w_2 c_a + w_3 v)$$

where the w's are assigned values for each activity a.

Example:

The attractivity of skiing in Peterborough County

Quantity: 750 (total lift capacity/hour)
Quality: 0.75
Cost factor: 0.37
Variety factor: 0.60

(assume for skiing the w's are : $w_1 = 0.8$, $w_2 = 0.7$, $w_3 = 0.2$)

Thus, attractivity for skiing in Peterborough County

$= 750 \times (0.8 \times 0.75 + 0.7 \times 0.37 + 0.2 \times 0.6)$

$= 735$

ment will be used to develop functions that will allow all attractivities to be calculated for the 14 single activities and 11 grouped activities on a zonal basis.

Provision will be available in the general model structure for varying the quality factor in the attractivity calculation according to different socio-economic groups. However, this provision will not be incorporated in the prototype.

An example of an attractivity calculation is shown opposite.

BLOCK S2 Travel Resistance Factors

FUNCTION

This block provides the functional relationships describing the resistance to travel between zones for recreation. These relationships will depend on the following characteristics:

- the nature of the specific activity or activity/accommodation package
- the length of the leisure-time period
- the socio-economic group of the trip-maker.

The resistance to travel can be expressed as a function of travel time, travel cost, travel distance, or all three.

ACTIVITIES

Resistance to travel depends to a great degree on the nature of the activity or activity/accommodation package. Distance is a strong deterrent for some activities, and less so for others. For the touring groups of activities, for example, the resistance to travel may be close to zero.

LENGTH OF LEISURE TIME PERIOD

The length of the leisure-time period is an obvious constraint that sets limits on how far a person will be willing to travel to engage in an activity. The more time spent travelling, the less time will be available within the period for actually engaging in the activity.

Travel time and activity time together determine a set of "life spaces" or radii of action over which persons living in a given origin zone can engage in an activity during a daily, weekend or vacation period.

SOCIO-ECONOMIC GROUP

Income will be an important factor in determining resistances to travel for certain types of trips. The cost of travel is an inhibiting factor for most longer trips, and particularly for travel to other parts of Canada or to other countries.

INPUT CATEGORIES AND SOURCES

A separate set of travel resistance functions is required by the model for each of the activity categories, each set differentiated by length of the leisure-time period and by socio-economic group. A portion of this information can be obtained from data that are available from existing surveys, but most would have come from new surveys designed with this requirement in mind.

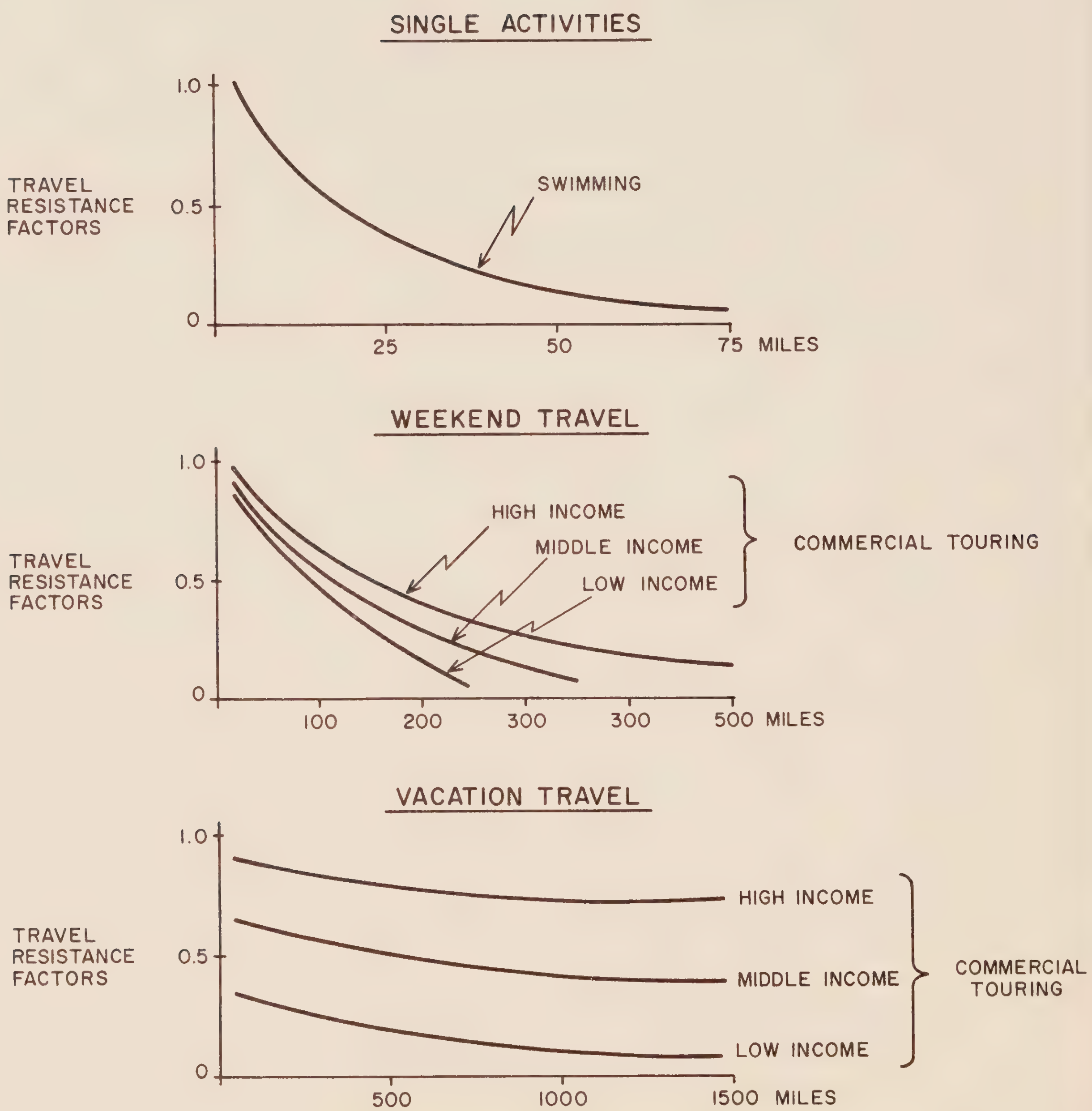
OUTPUT TO OTHER BLOCKS

This block provides the information required for calculation of accessibility indices in Block S4.

CALIBRATION - GENERAL

As indicated above, information is required to develop the functional relationships of travel resistance dependent upon certain important characteristics. Exact mathematical formulations of the

Examples:


SINGLE ACTIVITIES
TRAVEL RESISTANCE FACTORS
1.0
0.5
0
SWIMMING
25
50
75 MILES
WEEKEND TRAVEL
TRAVEL RESISTANCE FACTORS
1.0
0.5
0
HIGH INCOME
MIDDLE INCOME
LOW INCOME
COMMERCIAL TOURING
100
200
300
300
500 MILES
VACATION TRAVEL
TRAVEL RESISTANCE FACTORS
1.0
0.5
0
HIGH INCOME
MIDDLE INCOME
LOW INCOME
COMMERCIAL TOURING
500
1000
1500 MILES

functions are not necessarily required for input to Block S4; tables of corresponding values of distance versus resistance that could be looked up within Block S4 would be sufficient.

CALIBRATION - PROTOTYPE

For the prototype model, an attempt will be made to develop different travel resistance functions based on distance only, for the following categories:

- for each home-based recreation activity, a single function not differentiated by income
- for both weekend trips and extended (vacation) trips and for each of three classes of income as appropriate, a different distance resistance function for each of the activity/accommodation packages.

Difficulties with the existing data base may result in some of the travel resistance functions being based on judgement, but as many as possible will be checked with data from existing sources, such as the DHO Recon Survey and the Gordon Lusty Survey. A hypothetical example of travel resistance functions is shown opposite.

BLOCK S4 Accessibilities

FUNCTION

The purpose of this block is to compute an index of the accessibility of each zone of residence within Ontario to each activity or group of activities. This block uses the distance (or time/cost) resistance functions produced by Block S2 along with the attractivities calculated in Block S3 and a complete zone to zone distance matrix. In the prototype model accessibilities will be calculated using travel resistance functions based on distance. Expressed mathematically, this accessibility index would be:

$$AC_i^a = \sum_{j=1}^{N} AT_j^a \; g \; (dij)$$

where:

AC_i^a = the accessibility of zone i to activity a anywhere in the province

AT_j^a = the attractivity of zone j for activity a produced in Block S3

g = distance resistance function produced from Block S2

dij = the distance from zone i to zone j.

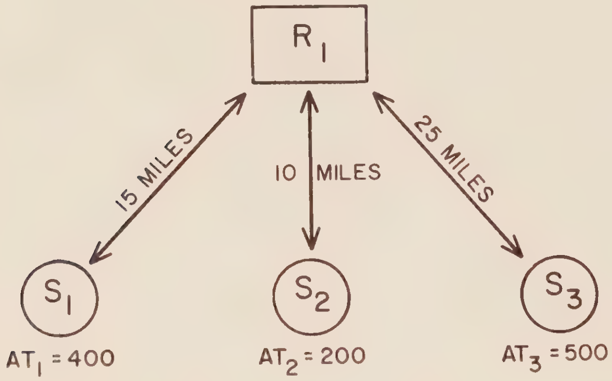
The distance will be calculated from population centroids in zones of residence to activity centroids, as appropriate, in destination zones.

INPUT CATEGORIES AND SOURCES

Requires three inputs:

Accessibilities

Example: For the purpose of illustration, suppose the province has 1 zone of residence and 3 zones where participation in swimming may occur.



Assume the attractivities for swimming in the 3 zones of supply are:

S1	400
S2	200
S3	500

The accessibility of zone of residence R_1 for swimming is equal to the summation over all zones of supply S_j of the attractivity in the zones of supply for swimming, multiplied by a function of travel distance from the zone of residence to the zone of supply.

Suppose that the travel resistance function supplied from block S2 in tabular form for swimming is

d_{ij} (miles)	$g(d_{ij})$
0	1.0
5	0.8
10	0.7
15	0.65
20	0.60
25	0.55
30	0.50

$$ACC_{R_1}^{swim} = (400 \times 0.65) + (200 \times 0.7) + (500 \times 0.55)$$

$$= 675$$

- attractivities from Block S3
- distance resistances from Block S2
- a zone to zone distance matrix.

<u>OUTPUT TO OTHER BLOCKS</u>

Feeds opportunity Blocks S5, S6 and S7.

A numerical example illustrating the procedure for computing accessibilities appears <u>opposite</u>.

BLOCK S5 Home-Based Opportunities

FUNCTION

This block determines the relative opportunities for various home-based activities accessible to persons living in a given zone of residence. The opportunities are expressed for each activity as a value relative to the opportunities for all other activities.

$$O_i^a = 100 \times AC_i^a / \left(\sum_{a=i}^{n} AC_i^a\right)$$

Where:

O_i^a = the relative opportunity of activity a compared to other activities for residents living in zone i.

AC_i^a = the accessibility of zone i to activity a.

n = the total number of activities available or being considered in the model.

INPUT CATEGORIES AND SOURCES

Same activities and activity/accommodation group categories as used throughout Blocks S1 to S4. Accessibility input from Block S4.

OUTPUT TO OTHER BLOCKS

Feeds daily participation match Block P1.

OPTIONAL OUTPUT (Reference 11 on Chart)

Relative opportunity indices for each daily activity for each zone of residence.

Home-Based Opportunities

Step 1. The accessibilities which were computed in Block S4 are normalized across all zones of residence for each activity as follows:

	Zone	Accessibility	Normalized Accessibility
Activity 5 - Boating	1	675	1.25
	2	650	1.21
	3	700	1.30
	4	830	1.54
	.	.	.
	.	.	.
	.	.	.
	.	.	.
	.	.	.
	.	.	.
	.	.	.
	.	.	.
	55	.	.
Total		53,750	55

The accessibilities are normalized so that they numerically add to the number of zones.

Step 2. Opportunities for all activities in each zone of residence are computed as follows:

Example: Zone 2

Activity	Normalized Accessibility	Opportunity Indices
1	1.26	5.9
2	.78	3.6
3	3.52	16.5
4	1.38	6.5
.	.	.
.	.	.
.	.	.
.	.	.
14	1.69	
	21.37	100

Opportunity for activity 1 in zone 2 = 1.26/21.37 x 100 = 5.9

A numerical example showing the process whereby relative opportunities will be computed appears <u>opposite</u>.

BLOCK S6 Weekend Travel Opportunities

FUNCTION

Similar to Block S5 except that opportunities are calculated using the appropriate accessibilities for weekend/activity accommodation bundles.

OUTPUT TO OTHER BLOCKS

Feeds weekend participation match Block P2.

OPTIONAL OUTPUT (Reference 12 on Chart)

Relative opportunity indices for weekend activity/accommodation packages available to each zone of residence.

BLOCK S7 Vacation Travel Opportunities

FUNCTION

Similar to Block S5 except that opportunities are calculated by use of the appropriate accessibilities for vacation activity/accommodation packages.

OUTPUT TO OTHER BLOCKS

Feeds vacation participation match Block P3 and vacation travel demand adjust Block P6.

OPTIONAL OUTPUT (Reference 13 on Chart)

Relative opportunity indices for vacation activity/accommodation packages available to each zone of residence.

BLOCK L8 Time-Period Shift

FUNCTION

This block is designed to provide a mechanism for time substitution of participation in certain activities from what would normally be non-home-based leisure periods into daily leisure-periods and vice versa. A special compare operation, shown on the model flow chart, compares the preferred daily activity demand schedule in Block D4 with the opportunity schedule produced in Block S5 for the same daily activities available to residents living in each zone of the province.

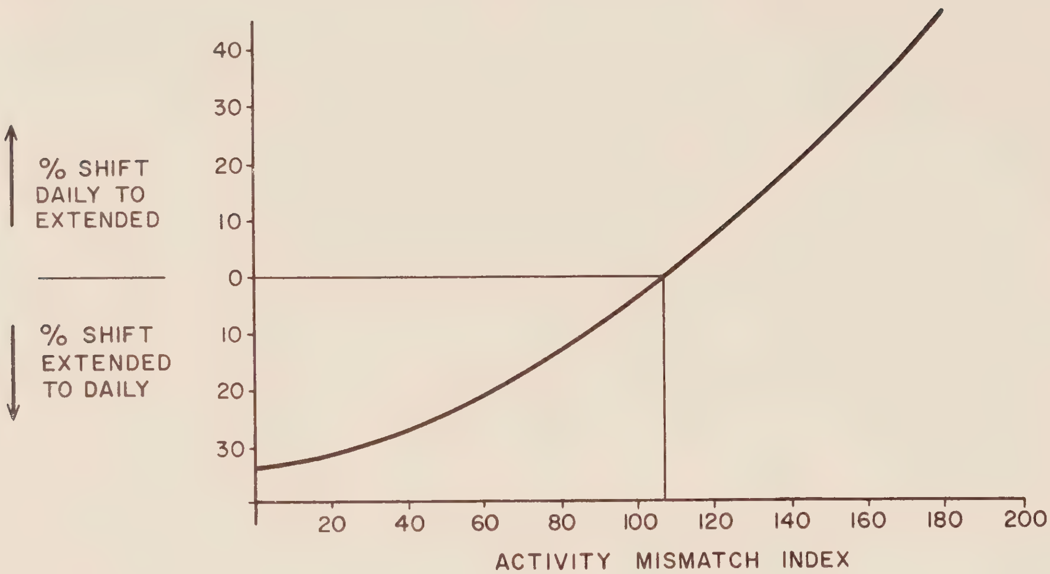
The postulate is that if the match between daily demand and daily opportunities is good, then there will be a greater inducement for residents of a zone to participate in activities in their zone on a daily basis rather than to travel away from their zone of residence to participate in daily activities away from home. Thus, if the match is good, Block L8 will convert some of the non-home-based leisure-periods that had already been developed in Block L4 to a number of single-day leisure-periods, more than the numbers of single-day periods that had previously been developed in Blocks L6 and L7.

INPUT CATEGORIES AND SOURCES

Input of leisure-time-period schedules from each of Blocks L4, L6 and L7 and also the input resulting from the compare operation that compares home-based daily demand with home-based daily opportunities.

L8 (Continued)

Step B - Time Shift Function



Example

Zone	Daily person Days	Extended Period Person Days	Mismatch Index	Revised Daily Person Days	Revised Extended Person Days
2	216,000	120,000	120.9	206,000	130,000
7	300,000	170,000	80.1	317,000	153,000

Time Shift Block

Step A - Compare Operation (between block D4 and S5)

Example: Zone 2

Activity	% Leisure Time	Residual Leisure Time Removed	Opportunity Indices	Absolute Difference
	1	2	3	4=2-3
1	15	21	5.9	15.1
2	7	9	3.6	5.4
3	3	4	16.5	12.5
4	6	8	6.5	1.5
5	7	10	.	.
6	2	3	.	.
7	3	4	.	.
8	1	1	.	.
9	6	8	.	.
10	4	5	.	.
11	6	8	.	.
12	3	4	.	.
13	7	10	.	.
14	4	5	.	.
15	26		.	.
Total	100	100	100	120.9

Activity mismatch index for Zone 2 = 120.9

OUTPUT TO OTHER BLOCKS

This block outputs revised leisure-time-period schedules to Blocks L9, L10 and L11 respectively.

CALIBRATION - GENERAL

The determination of how much demand can potentially be shifted into other time-periods requires a detailed study of recreational behaviour patterns. Most of the information required for this kind of analysis does not currently exist and new types of resident surveys would need to be carefully designed to provide the necessary data.

CALIBRATION - PROTOTYPE

For the calibration of the prototype, rational assumptions will be made regarding the degree of time-period shifting taking place. Provisions will be made for manual intervention in this block of the program in order to test the effects of a broad range of different assumptions.

A numerical example showing how the time shift operation may be performed in the prototype model, appears opposite. The operation consists of two steps. First, Step A produces a daily activity mismatch index for each zone, resulting from a comparison of the daily demand schedule with the daily opportunities schedules. Next, Step B performs the transfer of leisure-time, the amount and direction dependent upon the magnitude of the activity mismatch index.

BLOCK L9 Weekend Travel Time-Periods

FUNCTION

This block is a register which contains the total number of person and/or family weekend leisure-periods by socio-economic groups, after modification by the time-period shift Block L8.

INPUT CATEGORIES AND SOURCES

Input from Block L8.

OUTPUT TO OTHER BLOCKS

Output to weekend travel demand Block D2.

BLOCK L10 Vacation Travel Time-Periods

FUNCTION

This block is a register which contains the total number of person and/or family vacation leisure periods by socio-economic groups, after modification by the time-period shift Block L8.

INPUT CATEGORIES AND SOURCES

Input from Block L8.

OUTPUT TO OTHER BLOCKS

Output to Vacation Travel Demand Block D3.

BLOCK L11 Daily Leisure-Periods

FUNCTION

This block is a register which contains the total number of person daily leisure-periods by socio-economic groups, after modification by the time period shift Block L8.

INPUT CATEGORIES AND SOURCES

Input from Block L8.

OUTPUT TO OTHER BLOCKS

Output to Daily Activity Demand Block D5. This block actually contains two inputs from Block L8, one of week-day leisure periods and the other of weekend-day leisure-periods. Since the model will likely be run from this point for either a week-day design period or a weekend-day design period, only one output is shown from this Block to D5.

BLOCK D2 Weekend Travel Demand

FUNCTION

The purpose of this block is to combine the demand schedule for non-home-based activity/accommodation packages, expressed as percentages by Block D1, with the schedule of weekend travel time periods available in the leisure time budget, from block L9, to produce an absolute demand expressed as the number of person and/or party trip-days on weekend periods for the various activity/accommodation packages.

INPUT CATEGORIES AND SOURCES

Two inputs - weekend travel demand schedule
- weekend leisure-periods available.

OUTPUT TO OTHER BLOCKS

Output to weekend match participation Block P2.

OPTIONAL OUTPUT (Reference 8 on Chart)

The number of persons and/or party trip-days on weekend periods for each activity/accommodation package for each zone of residence.

BLOCK D3 Vacation Travel Demand

FUNCTION

The purpose of this block is to combine the demand schedule for non-home-based activity/accommodation packages expressed as percentages by Block D1, with the schedule of vacation-travel time periods available in the leisure-time budget, from Block L10, to produce an absolute demand expressed as the number of person and/or party trip-days on vacation periods for the various activity/accommodation packages.

INPUT CATEGORIES AND SOURCES

Two inputs - vacation travel demand schedule
- vacation leisure-periods available.

OUTPUT TO OTHER BLOCKS

Output to vacation adjust travel demand Block P6.

OPTIONAL OUTPUT (Reference 7 on Chart)

The number of persons and/or party trip-days on vacation periods for each activity/accommodation package for each zone of residence.

D5 Daily Activity Demand Pattern

Example: Zone 2

Total Daily Person Days = 206,000

Activity	% Allocation	Activity Day
1	15	31,300
2	7	14,400
3	3	6,200
4	6	12,500
5	7	14,400
6	2	3,100
7	3	6,200
8	1	2,100
9	6	12,400
10	4	8.200
11	6	12,500
12	3	6,200
13	7	14,600
14	4	8,200
15	26	53,700
		206,000

BLOCK D5 Daily Activity Demand Pattern

FUNCTION

The purpose of this block is to combine the schedule of demand for home-based daily activities, expressed as percentages from Block D4, with the schedule of daily leisure-periods, available from Block L11, to produce a demand for travel for daily activities expressed in terms of total person-days, by activities.

INPUT CATEGORIES AND SOURCES

Two inputs - daily activity demand schedule
- daily leisure-periods available.

OUTPUT TO OTHER BLOCKS

Output to daily match participation Block P1.

OPTIONAL OUTPUT (Reference 9 on Chart)

The number of person days demand in daily periods for each activity in each zone of residence.

A numerical example showing the production of a daily activity demand pattern appears opposite.

BLOCK P1 Daily Activities Match

FUNCTION

The purpose of this block is to match the daily activities demand schedule to the daily activities opportunities schedule and to compute the substitution that may occur of one activity for another. In addition, provision is made in cases of particularly poor matches for all outdoor recreation activities, for some portion of the demand for outdoor recreation activities to drop out completely at this stage into a residual leisure category.

INPUT CATEGORIES AND SOURCES

Input to this block comes from:

- the home-based activities opportunities Block S5
- the home-based activities demand Block D5.

Categories for each of these inputs are described in the respective blocks from which they are supplied.

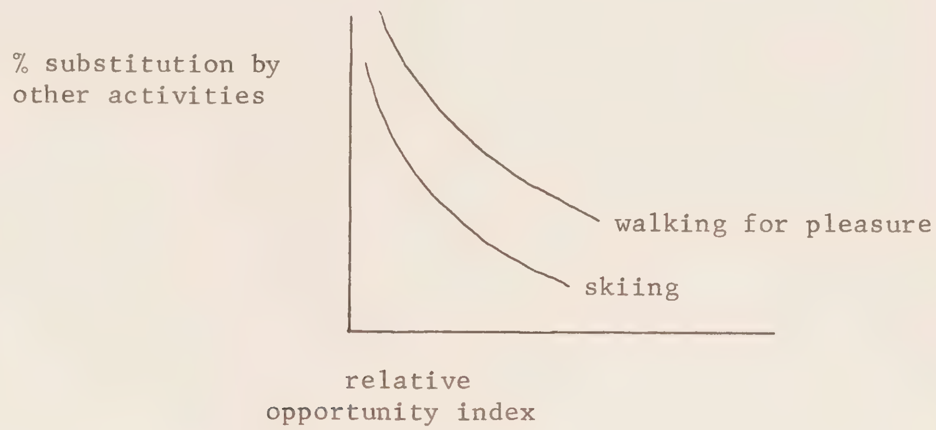
OUTPUT TO OTHER BLOCKS

This block supplies the daily activity participation Block P4.

CALIBRATION - GENERAL

In order to calibrate this block it will be necessary to determine for each of the activities and activity/accommodation packages the functions that describe the relationships between the relative

opportunity index and the percentage substitution of an activity by other activities. These functions may be thought of as substitution curves of the following general form.

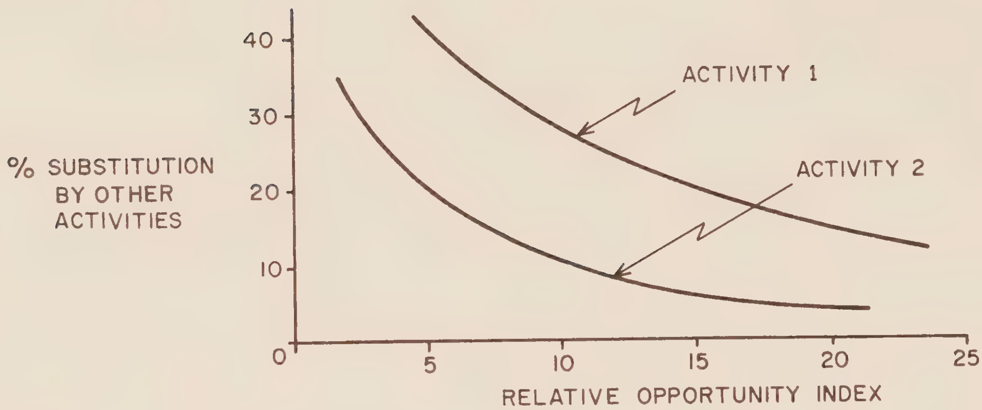


Some information on the general position of these curves relative to one another may be obtained from existing data sources. Most information, however, would have to come from a new survey specially designed for this purpose.

CALIBRATION - PROTOTYPE

For purposes of calibrating the prototype model, the relative positions of activities representing possible extremes of commitment will be postulated, with the other activities falling in between in such a way that the relative positioning of all the curves appears reasonable. Experiments will be performed that make assumptions of various slopes for these curves until participation rates are obtained which agree with existing participation data. These curves are strongly related to the travel resistance curves described in Block S2 and there

Match Demand to Daily Opportunities



Example: Zone 2

Activity	Demand Activity Days	Rel. Opportunity Index	% Shift	Demand Reduction	Participation Days	Re-adjusted Participation Days
1	31,300	5.9	17	5,300	26,000	30,600
2	14,400	3.6	21	3,000	11,400	13,400
3	6,200	16.5	7	400	5,800	7,300
4	12,500	6.5	14	1,700	10,800	12,700
5	.	.				
6	.	.				
.	.	.				
.	.	.				
.	.	.				
.	.	.				
15	.	.				
Total	206,000	100		31,000	175,000	206,000

would be as many activity substitution curves as there are travel resistance functions.

A numerical example showing how the substitution process might work in the prototype model appears <u>opposite</u>.

BLOCK P2 Weekend Travel Match

FUNCTION

The function of this block is similar to that of Block P1, except that this block performs the operation of matching the weekend activity/accommodation demand schedule to the corresponding schedule for weekend opportunities. It also drops out of Ontario recreation a certain percentage of Ontario residents who cannot satisfy all of their weekend demand within Ontario.

INPUT CATEGORIES AND SOURCES

Input to this block comes from:

- the weekend travel opportunities Block S6
- the weekend travel demand Block D5.

Categories for each of these inputs are described in the respective blocks from which they are supplied.

OUTPUT TO OTHER BLOCKS

The block supplies the weekend travel participation Block P5 and the vacation travel demand adjusting Block P6.

FINAL OUTPUT (Reference 24 on Chart)

Provides a final output summary of total residence leaving Ontario for weekend travel activities.

CALIBRATION - GENERAL

See Block P1.

CALIBRATION - PROTOTYPE

See Block P1.

BLOCK P3 Vacation Travel Match

FUNCTION

The function of this block is similar to that of Block P1 except that this block performs the operation of matching the vacation activity/accommodation demand schedule to the corresponding schedule for vacation opportunities. It also drops out of Ontario certain percentage of Ontario residents who cannot satisfy all of their vacation demand within Ontario.

INPUT CATEGORIES AND SOURCES

Input to this block comes from:

- the vacation travel opportunities Block S7
- the vacation travel demand adjusting Block P6.

OUTPUT TO OTHER BLOCKS

The block supplies the vacation travel participation Block P7.

FINAL OUTPUT (Reference 24 on Chart)

Provides a final output summary of total residents leaving Ontario for vacation travel activities.

CALIBRATION - GENERAL

See Block P1.

CALIBRATION - PROTOTYPE

See Block P1.

BLOCK P4 Daily Activity Participation

FUNCTION

This block is a register containing the estimated amount of daily activity participation, by activity, for each zone of residence in the Province.

INPUT CATEGORIES AND SOURCES

Input from Block P1.

OUTPUT TO OTHER BLOCKS

Output to Block K1.

OPTIONAL OUTPUT (Reference 14 on Chart)

Daily-user activities participation by activity for zones of residence expressed in units of participation in person-days.

BLOCK P5 Weekend Travel Participation

FUNCTION

This block is a register containing the estimated amount of weekend travel activity participation by activity/accommodation package for each zone of residence in the Province. Block is similar in function to P4.

INPUT CATEGORIES AND SOURCES

Input from Block P2.

OUTPUT TO OTHER BLOCKS

Output to Block K2.

OPTIONAL OUTPUT (Reference 15 on Chart)

Weekend travel activity participation by activity/accommodation package for zones of residence expressed in units of person and/or party participation days.

BLOCK P6 Adjust Vacation Travel Demand

FUNCTION

The purpose of this block is to provide a means of modifying the vacation travel demand, depending on how well the weekend travel demand has been matched to weekend travel opportunities. In situations where the weekend match is poor for particular activity/accommodation packages, the vacation travel demand will be adjusted upwards.

INPUT CATEGORIES AND SOURCES

Input from:

- weekend travel match Block P2
- vacation travel demand Block D3
- vacation travel opportunities Block S7.

OUTPUT TO OTHER BLOCKS

Feeds the vacation travel match Block P3.

CALIBRATION - GENERAL

Similar to the procedure in Block L8.

CALIBRATION - PROTOTYPE

Similar to the procedure in Block L8.

<u>BLOCK P7</u> Vacation Travel Participation

<u>FUNCTION</u>

This block is a register containing the estimated amount of vacation travel activity participation by activity/accommodation package for each zone of residence in the Province. It is similar in function to P4.

<u>INPUT CATEGORIES AND SOURCES</u>

Input from Block P3.

<u>OUTPUT TO OTHER BLOCKS</u>

Output to Block K3.

<u>OPTIONAL OUTPUT</u> (Reference 16 on Chart)

Vacation travel activity participation by activity/accommodation package for zones of residence expressed in units of person and/or party participation-days.

BLOCK N1 Non-residents at Points of Entry

FUNCTION

This block is the basic file of data on non-residents visiting Ontario by point of entry to the Province.

INPUT CATEGORIES AND SOURCES

Most of the important basic data on the quantitative aspects of tourism in Ontario by non-Canadians is available from the Dominion Bureau of Statistics. Consequently, data categories on duration of visit, party size, etc., must be compatible with this source. Data on other aspects of the visit to Ontario such as activities participated in, types of accommodation used, etc., are relatable to other sources such as exit surveys.

OUTPUT TO OTHER BLOCKS

This block feeds information to Block N2.

CALIBRATION - GENERAL

For calibrating this block of the model, it is necessary to have all relevant information on the characteristics of the non-residents who visit Ontario. This would involve also a comparison of the recreational opportunity characteristics of large regions of Ontario compared with the individual states of origin in the U.S., and possibly a comparison of Canadian opportunities with other countries.

CALIBRATION - PROTOTYPE

There is not a great deal of information readily available to measure the characteristics of recreational opportunity outside Ontario. For this reason, calibration of the prototype will be restricted to a comparison of the external regions with regions in Ontario for the purpose of making rational assumptions about the growth in tourism to Ontario in future years.

BLOCK N2 Non-Resident Grouping

FUNCTION

This block acts as a register for the aggregated non-resident data supplied to it from Block N1. The total number of non-residents at each point of entry is stratified into a number of compartments according to the most significant characteristics.

INPUT CATEGORIES AND SOURCES

From Block N1.

OUTPUT TO OTHER BLOCKS

This block feeds the three Blocks N3, N4 and N5 corresponding to daily, weekend travel and vacation travel respectively.

CALIBRATION - GENERAL

The general means of stratifying the population will be according to two main categories, region of origin and family income.

CALIBRATION - PROTOTYPE

Data for each point of entry will be stratified according to the ten nearest and most significant external regions for tourism to Ontario and two family income groups, under $10,000 and $10,000 and over.

BLOCK N3 Non-Resident Daily Travel Participation

FUNCTION

This block acts as a register containing the total amount of daily participation by non-resident groups as defined in Block N2.

INPUT CATEGORIES AND SOURCES

From Block N2.

OUTPUT TO OTHER BLOCKS

This block feeds the non-resident daily distribution Block K4.

OTPIONAL OUTPUT (Reference 19 on Chart)

Daily user activities participation for each point of entry expressed in units of participation person-days.

BLOCK N4 Non-Resident Weekend Travel Participation

FUNCTION

This block is similar to N3 and acts as a register containing the total amount of weekend travel participation by non-resident groups as defined in Block N2.

INPUT CATEGORIES AND SOURCES

From Block N2.

OUTPUT TO OTHER BLOCKS

This block feeds the weekly travel distribution Block K2.

OPTIONAL OUTPUT (Reference 20 on Chart)

Weekend travel activities/accommodation package participation for each point of entry expressed in units of participation person and/or party-days.

BLOCK N5 Non-Resident Vacation Travel Participation

FUNCTION

This block is similar to N3 and acts as a register containing the total amount of vacation travel participation by non-resident groups as defined in Block N2.

INPUT CATEGORIES AND SOURCES

From Block N2.

OUTPUT TO OTHER BLOCKS

This block feeds vacation travel participation Block K3.

OPTIONAL OUTPUT (Reference 21 on Chart)

Vacation travel activities/accommodation package participation for each point of entry expressed in units of participation person and/or party-days.

BLOCK K1 Distribute

FUNCTION

The function of this block is to distribute people engaging in home-based daily activities from each zone of residence to destination zones of recreational opportunity.

INPUT CATEGORIES AND SOURCES

The amount of daily activity participation by activity for each zone of residence is fed from Block P4. Although not shown on the chart, the attractivity of all zones is supplied from Block S3 and the travel resistance functions from Block S2.

OUTPUT TO OTHER BLOCKS

Feeds consumption of daily activities to Block C1.

OPTIONAL OUTPUT

Nil

CALIBRATION - GENERAL

The distribution of people to activities will be based on the gravity model concept used in many trip distribution simulation models. In this application the generators will be the total activity participation of the attractivities calculated for the zones of recreational opportunity. The travel resistance functions will be the same as those used for calculating accessibilities in Block S4. Examination of the

K1 Continued

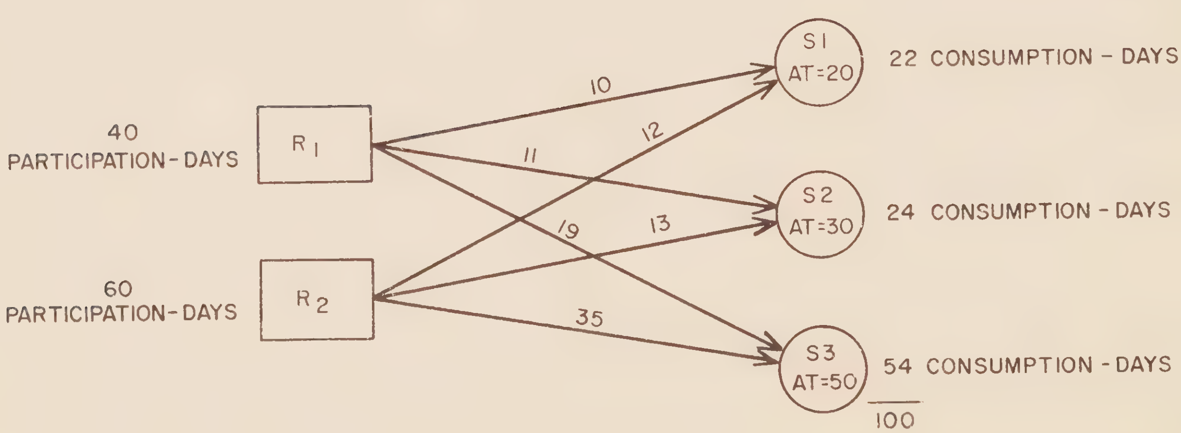
Calculations

for P_1 $$\sum_{j=1}^{m} AT_j f(d_{ij}) = 20 \times .90 = 18$$
$$+ \ 30 \times .65 = 19$$
$$+ \ 50 \times .70 = \underline{35}$$
$$72$$

$$T_{R_1-S_1} = 40 \times 18/72 = 10$$
$$T_{R_1-S_2} = 40 \times 19/72 = 11$$
$$T_{R_1-S_3} = 40 \times 35/72 = \underline{19}$$
$$40$$

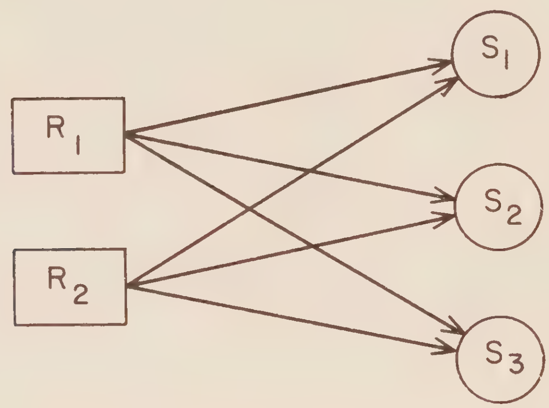
for R_2 $$\sum_{j=1}^{m} AT_j f(d_{ij}) = 20 \times .85 = 17$$
$$+ \ 30 \times .60 = 18$$
$$+ \ 50 \times .95 = \underline{48}$$
$$83$$

$$T_{R_2-S_1} = 60 \times 17/83 = 12$$
$$T_{R_2-S_2} = 60 \times 18/83 = 13$$
$$T_{R_2-S_3} = 60 \times 48/83 = \underline{35}$$
$$60$$



Distribute

Example: For the purpose of illustration, suppose the province has 2 zones of residence and 3 zones where participation in swimming may occur.



Data

Mileages	
$R_1 - S_1$	20
$R_1 - S_2$	60
$R_1 - S_3$	50
$R_2 - S_1$	30
$R_2 - S_2$	70
$R_2 - S_3$	10

Daily Participation Days	
R_1	40
R_2	60
	100

Attractivities	
S_1	20
S_2	30
S_3	50
	100

Travel Resistence Function

d	F(d)
10	.95
20	.90
30	.85
40	.75
50	.70
60	.65
70	.60
80	.55

Formula

$$T_{ij}=P_iAT_jF(d_{ij})/(\sum_{j=1}^{m} AT_jf(d_{ij}))$$

where: T_{ij} = trips from zone i to zone j

P_i = Swimming participation days of zor

AT_j = Attractivity of zone j for swimmi

$f(d_{ij})$ = Travel resistence for distance

distribution patterns obtained during calibration of this block will help evaluate the travel resistance functions used for calculating the accessibilities in Block S4.

The principle of operation of the gravity model applied here will be to constrain the origin totals of participation-days. This will ensure that the number of participation-days produced by a zone is equivalent to the generating strength. On the other hand, the destination zones will be unconstrained as to the number of consumption-days assigned to them by this distribution block.

CALIBRATION - PROTOTYPE

The calibration of this block actually proceeds in parallel with the calibration of S4 so that the remarks applying to the determination of the travel resistance functions apply equally here.

A simple illustration example of the distribution process appears opposite.

<u>BLOCK</u> K2 Distribute

FUNCTION

This block operates in the same manner as the daily activity distribution block K1 except that it distributes weekend travel activity participation.

INPUT CATEGORIES AND SOURCES

The amount of weekend travel activity participation for each zone of residence is fed from block P5 for residents and block N4 for non-residents. Attractivities are fed from block S3.

OUTPUT TO OTHER BLOCKS

Feeds activities conversion block C2 and lodging conversion block C3.

CALIBRATION - GENERAL

See block K1.

CALIBRATION - PROTOTYPE

See block K1.

BLOCK K3 Distribute

FUNCTION

This block operates in the same manner as the daily activity distribution block K1 except that it distributes vacation travel activity participation.

INPUT CATEGORIES AND SOURCES

The amount of vacation travel participation for each zone of residence is fed from block P7 for residents of Ontario and from block N5 for non-residents. Attractivities are fed from block S3.

OUTPUT TO OTHER BLOCKS

Feeds activities conversion block C2 and lodging conversion block C3.

CALIBRATION - GENERAL

See block K1.

CALIBRATION - PROTOTYPE

See block K1.

BLOCK K4 Distribute

FUNCTION

This block operates in a similar manner to the daily activity distribution for residents block K1 except that it distributes daily participation of non-residents within Ontario irrespective of activity.

INPUT CATEGORIES AND SOURCES

The amount of daily activity participation by activity for each point of entry of non-residents is fed from block N3. The attractivity of all zones of destination within Ontario is supplied from block S3.

OUTPUT TO OTHER BLOCKS

Feeds conversion of daily activities block C2.

CALIBRATION - GENERAL

See block K1.

CALIBRATION - PROTOTYPE

See block K1.

BLOCK C1 Consumption of Activities.

FUNCTION

This block is a register containing the daily-user activities consumption at each destination zone.

INPUT CATEGORIES AND SOURCES

Input from block K1.

OUTPUT TO OTHER BLOCKS

This block supplies output to the final output block 22 - consumption of activities at location j. The output is expressed as units of participation person-days by recreational activity.

OPTIONAL OUTPUT (Reference 17 on Chart)

The output of daily-user activities from this block can be obtained separately from that fed to final output block 22.

BLOCK C2 Conversion to Consumption Activities.

FUNCTION

The purpose of this block is to convert the consumption of activity/accommodation packages into an equivalent consumption of individual recreation activities at each destination zone. These activities are the same as used for home-based recreation, enabling a picture of total usage in each zone by activities to be found.

INPUT CATEGORIES AND SOURCES

Input to this block is from the distribution blocks K2 and K3 that distribute activity/accommodation package travel to destination zones, and K4 that distributes daily activities of non-residents to destination zones.

OUTPUT TO OTHER BLOCKS

This block supplies output to the final output block 22 - consumption of activities at location j. The output is expressed as units of participation in person and/or party days by recreational activity.

OPTIONAL OUTPUT (Reference 18 on Chart)

The output of equivalent activities consumption by non-home -based users can be obtained separately from this block.

CALIBRATION - GENERAL

In order to calibrate this block, it is necessary to have

C2 Conversion to Activities

The following is an example of a typical set of conversion factors:

Activity/Accommodation package

Activity	1	2	3	4	.	.	.	.
1	1.75	2.0	2.35					
2	3.00	0	0.50	0.75				
3	2.15	3.75						
4	1.50							
.								
.								
.								
.								

The conversion factors are multiplied by the group unit Activity/ accommodation package consumption days to produce the consumption in terms of individual activity person days in the destination zone.

Example: Destination Zone 34

Activity/Accommodation Package	Group Unit Days	Activity	Conversion Factor	Individual Activity Person Days
1	3,500	1	1.75	6,150
		2	3.00	10,500
		3	2.15	7,500
		.		
		.		
2	2,000	1	2.00	4,000
		2	0	0
		3	3.75	7,500
		.		
		.		
		.		

data which describe the kinds of activities that are associated with different types of accommodation in different locations. The information required would include data on frequency of participation in individual activities by users of various accommodation types.

CALIBRATION - PROTOTYPE

Although the data for this is rather sparse, some information is available or may be imputed from the Canadian Facts 8M surveys, the Gordon Lusty survey, and the Park User surveys. This will be done mainly by comparing participation in each activity arrived at by the home-based model with the measured values. Any deficiency must be due to non-home-based users, and the reasonableness of this assumption can be checked by judgement.

A numerical example of the conversion process for converting activity/accommodation packages to individual activities appears opposite.

BLOCK C3 Conversion to Consumption of Lodging.

FUNCTION

The purpose of this block is to convert the consumption of activity/accommodation packages into actual lodging consumed at each destination zone.

INPUT CATEGORIES AND SOURCES

Input to this block is from the two distribution blocks K2 and K3 that distribute activity/accommodation package travel to destination zones.

OUTPUT TO OTHER BLOCKS

This block supplies output to this final output Block 23 - consumption of lodging facilities at location j. The output is expressed as units of participation person and/or party-days by type of accommodation facility.

CALIBRATION - GENERAL

The calibration of this block is rather straightforward. A relationship would be developed to describe the actual number of accommodation nights by accommodation type related to the different activity/accommodation packages being used throughout the model.

CALIBRATION - PROTOTYPE

Good information on occupancy rates of commercial establish-

ments is available from the Department of Tourism and Information. Usage of Provincial Parks is also available. Usage of homes of friends or relatives and summer cottages, trailers, etc., will have to be estimated from existing surveys, in particular the Gordon Lusty survey.

IV - APPLICATIONS OF THE REFINED MODEL AND OF THE PROTOTYPE TO DEVELOPMENT OF A PLANNING PROCESS

The primary objective of constructing a refined mathematical model of recreational demand and supply is to provide a continually useful tool for both short- and long-range planning aimed at the beneficial use of resources for tourism and recreation on provincial and regional scales in Ontario.

The primary objective of constructing a prototype model is to effect economies in the processes of model-making, information gathering and processing, for effective planning.

The purpose of this section is to examine the extent to which these objectives may be met by the procedures described in the previous sections of this report. We will first clarify the conceptual relationship of the prototype and refined models. Next, we will discuss the role of each in terms of their outputs and the insights into future recreational requirements that these can confidently be expected to yield.

THE RELATION OF THE PROTOTYPE TO THE REFINED MODEL

The overall model concept described in the preceding sections is our view of what the ultimate refined model should and could be; the prototype model proposal gives our view of how the concept could be made operational, now. The concept attempts to bring together all pertinent factors about the people of Ontario that have any bearing on their present

needs and desires with respect to tourism and outdoor recreation, and the extent to which these are met within the Province. We do not believe that the refined model will differ in overall concept, structure or function from the prototype model. It will differ in two ways, however:

1. In many components, particularly those concerning leisure-time budgets, substitutability and participation data for some activities, data available now are inadequate, and the calibration of the prototype will be largely based on judgement. In the refined model, calibration of all model blocks will be based on appropriate data, much of it new, and all of it up to date. Possibly one of the most important products of the prototype development will be the specification of required data collection programs.

2. Certain components, mainly in the demand and substitution portions, will require further behavioural research. In the refined model, some of these blocks may differ operationally from those of the prototype, but their functional specifications will remain the same. This is the essence of the "modular" nature of the model-building concept, where the framework remains constant but new elements may be added as they become ready.

The above distinctions have important implications for the use of output from the prototype model. At its initial stage of development, the prototype model will produce results which are indicative of recreational behaviour rather than "correct" in an absolute sense. Their use for planning should therefore be more as a means of improved understanding of recreational behaviour and participation rather than as a firm basis for planning decisions. Output will steadily improve for planning purposes as more experience is gained with the prototype, more data becomes available for statistical analyses, and the refined model emerges.

TABLE IV-1

MODEL OUTPUT

PLANNING LEVEL	DESCRIPTION	FIGURE III-1 REFERENCE	APPLICATION	LIMITATIONS IN PROTOTYPE
1	Total activities consumption at destination zones - given in units of person-days by recreational activity.	22	This gives the picture of activity pressure experienced in each destination zone.	With accurate participation estimates the picture should be reasonable, except for certain activities for which little destination data is available, eg. walking for pleasure.
2	Daily user activities consumption at destination zones - same units as above. Weekend and vacation user activities consumption at destination zones - same units as above.	17 18	These two show how much of the pressure of activities in each zone is due to home-based users vs. users who find accommodation in the zone.	Similar comments to above, but slightly less precision should be expected.
	Daily user activities participation from origin zones - same units as above. Weekend and vacation user activity/accommodation package participation from origin zones - units of no's of party and/or person trips by package types.	14 19 15 16 20 21	These two show what is the outward pressure of activities and trips actually engaged in by residents of each zone, i.e., this gives activities and trips made from all origin zones.	The output will be firm only for activities and trip-types based on origin/destination data, e.g. Provincial Park camping.
3	Daily user activities demand from origin zones - same units as above. Weekend and vacation user activities demand from origin zones - same units as above (party and/or person trip days)	3 9 2 7 8	These two show what the desires of the residents of a zone are. A comparison with their actual behaviour (i.e. participation) shows what latent demands remain unsatisfied.	These outputs will be based on demand and substit ution blocks which require further research. Therefore, they cannot be expected to be accurate in any absolute sense. They should, however, be of use in comparative analyses, i.e. of one set of assumptions vs. another.
4	Daily user activity opportunity set available from origin zones - units of relative opportunity indices by activities Weekend and vacation user activity/accommodation package opportunities set available from origin zones - relative opportunity indices by activity/accommodation package. Attractivity values of a zone for an activity (could be modified by accessibility of population).	11 12 13 25	These two show what the effective opportunities for recreation are in each origin zones. This permits an assessment of which areas are "underprivileged" in recreation, to what extent and in which activities, etc.	The prototype should be reasonable in this area since it is based partially on supply features for which data may be obtained.
5	Inventory of facilities by destination zones - units of capacity in recreation days.	10	This will be a summary printout of the inventory data fed into the model for a particular run. Mainly for record purposes, but could be used to identify areas of high or low densities, etc.	Same comment as immediately above.
	Leisure time budgets available by origin zones - no's of single days, weekends and vacation periods.	4 5 6 4a 5a 6a 4b	This will be a printout of the leisure time available in total in each origin zone, and could be used in analyses of needs for social recreation as well as of leisure "outlets" as a whole.	This output will be based on judgement data and should be used for comparative analyses only.
	Socio-economic group population by origin zones - no's of people and/or family units.	1	This will be a summary printout of the demographic data fed into the model for a particular run. Mainly for record purposes, but could be used as a segmented market analysis.	The number of socio-economic categories may be larger in the refined model than in the prototype, if more data are available and usable in this area.

OUTPUTS OF BOTH MODELS

Table IV-1 opposite gives a functional listing of what the model outputs would be. The numbers in the central column refer to the circled output numbers which appear on the detailed model chart in Section III. The central and right-hand columns of the table present a brief description of the main application of the particular output item in recreational planning, and a brief statement of how "hard" or trust-worthy the particular output item is expected to be in the prototype.

These outputs represent the model's interpretation of the recreation system. They are also its means of communication to data analysts and provincial planners. Therefore it is essential for this examination, to consider how each version of the model will be run and how the outputs described in Section III and summarized in Table IV-1 may be used in planning.

HOW THE MODELS WILL BE RUN

Before we discuss the particular planning uses of outputs of the models, it is perhaps appropriate to outline the sorts of inputs which they must be supplied with, in two cases:

- for each run
- for special runs, such as where the planner wishes to test the system response to altered behavioural assumptions.

For each run, either model must be supplied with the basic demographic inputs of population by zone and by socio-economic group, pertinent to the year for which forecasts are required.

Similarly, the model must be provided with supply "inventory" data for each run. Initially, this will represent the actual inventory of supply for the base year, 1966. For other runs, say for a future year, any changes in recreational resources such as would normally be made by plans of agencies of government at any level or by the private sector, would be added into inventory on a zone by zone basis as an increment over the base-year inventory. It may, of course, be useful to run the model for a future year without adding any inventory at all. This procedure would result in the model showing in each case the degree of "overpressure", i.e. participation beyond 1966 capacity, which could be thought of as latent participation. Such results could be used in the early formulation of plans to bring more recreational resources into production, which would then be tested as described above to see if, in fact, the overpressures would disappear.

The model will have built into it certain areas of relationships and assumptions that can be changed if a planner wishes, but that do not have to be fed in each time it is to be run. In the manuals describing the prototype, we would provide details of how to make such changes. A general indication of the sorts of changes we mean and approximately how they would be made is given below:

- leisure time budgets
- activity preference schedules
- changes in access parameters
- changes in attraction parameters.

These will be discussed in order. If a planner wishes to test the effect of a change in leisure-time budgets, such as the introduction of a four-day week or the lengthening of the school year, it will be possible for him to change leisure-time budgets allocated automatically by the model by "manually overriding". The model outputs would then all automatically reflect this change, and the planner could compare whatever outputs he wished to study.

Activity preference schedules may also be overridden manually by the user. That is, the user could supply the model with any form of activity preferences he might wish to test. For instance, he might wish to hypothesize a marked decline in some activity, or even the emergence of a new activity. He would have to draw up new preference schedules with the diminished activity lower on the list, or the additional activity incorporated in the weighted ranking in whatever position he feels it might take. The model would then produce its outputs showing the effect of the changes. Note that for the model to distribute participation in a new activity to destination zones, information on the supply of the new activity would have to be provided as well, along with an indication of which existing activity would be most similar to the new one in terms of people's willingness to travel for it.

Changes in access parameters could occur, for example, if a new road was constructed in some area, or if an existing one was improved. Highway plans for a future year should therefore be used to modify access parameters for model runs pertaining to the future year. Changes in pricing also affect access, and may be set at any level proposed for plan-testing.

Changes in attraction parameters may occur in two main ways. The overall attractivity of a destination zone may be increased through planning action that improves either its capacity or its quality. On the other hand, attractivity may be decreased through crowding or other effects that reduce capacity or degrade quality. The model has no automatic provisions for adjusting these factors, since we feel that this would be inappropriate. The user must, therefore, be prepared to insert such changes manually, either as a consequence of some plan he wishes to test, or as a result of some other development such as industrial growth in some zones, or as a result of some analysis of ecological effects of intensive use or of protective measures.

THE PLANNERS' NEEDS FOR MODEL OUTPUTS

In order to prepare realistic plans for tourism and recreation land-use, activity opportunities, lodging and other service facilities, and means of access from centres of demand, it is essential to be guided by sound foresight in the following major dimensions:

Quantity

How many facilities or amenities of each type will be required? This involves number, size and capacity of beaches, boat-launching areas, marinas, golf courses, nature trails, etc.; hotels, lodges, cabins, cottages, etc.; acreages for hunting, skiing, water skiing, fishing, and all the other physical requirements to satisfy demand.

Quality

What volume of recreational use can be accommodated without environmental damage, and at what cost? In this assessment it is important to gauge both factors at two levels.

Environmental quality can be changed without deterioration to human health and security: wilderness can be "groomed" and made more acceptable to the masses, even though its natural character is lost forever, and so we must have criteria for weighing the effect of various densities of use both on the natural environment and the human response.

As regards cost, we must take into account both the cost to the individual segments of the public, in terms of what they can afford, and the cost to society, not the least of which may be the cost of poor planning to future generations.

Location

Where should the planned developments be sited with respect to the needs and demands of populations and the distribution of natural resources? This question is of prime significance to highway planners, as well as to all persons concerned with optimum land use and all urban residents. Should we build cities close to recreational opportunities or create recreational opportunities close to and inside urban areas?

Timing

What is the optimum time schedule for implementation of the quantitative, qualitative and locational plans? Should we lead consumption figures and aim to satisfy demand with the aim of bettering human life, or seek to optimize the system on strictly cost-benefit criteria? The former policy would almost certainly be incredibly

> expensive in terms of highway costs, the economies of facilities and the impact on other sectoral needs. The latter might well hold back our natural buoyant productivity.
>
> In planning recreational developments it is vitally important to incorporate allowances for the long time scale of their amortization and the potentially neutralizing effect they may have on future developments.

The model concept has been evolved carefully to provide forecasts that can be used to develop estimates applicable to decision-making in all these dimensions. No model can be designed to provide the explicit answers to these questions and this model does not. It is, however, intended to provde guidelines for planning and decision-making by providing estimates of demand, participation and consumption, and their spatial distribution. Although such estimates derived from the prototype model will of necessity be very approximate, they will be better than any now available.

The fact that no plan made in the early 1970's can be expected to be appropriate for the 1990's brings up the significance of evolving a continuous planning process, rather than drawing up an Olympian plan. Development of a prototype model and evolving it into a more and more refined form is consistent with the principle of dynamic planning.

PLANNING REQUIREMENTS RELATED TO MODEL OUTPUTS

To assess the potential usefulness of the model, in both prototype and refined stages of development, it will be well to check its outputs for the data needed for long-range provincial-regional tourism and outdoor recreation planning, as outlined above.

Quantity

The model, in both forms, is designed to produce estimates of the demand, the participation originating in all populated areas, and the consumption occurring in all supply areas, in terms of person days for each activity and person and party-days for each accommodation/activity package. Furthermore, it is so designed as to yield this information for each season of the year and for weekend and midweek periods. It will therefore produce estimates of the peaking and seasonality cycles that are so important to recreation planning and particularly to the economics of recreational enterprises.

The model, at no stage of refinement, is intended to convert activity and accommodation consumption into acreages, numbers of facilities, etc. This is the planner's job and requires economic and aesthetic judgement which should not be mechanized. The model outputs will, however, give planners criteria for advising decision-makers on the alternative economic and social results to be expected from alternative plans.

Quality

Neither version of the model, nor none that we can now foresee, will yield any indication of the environmental effect of alternative densities of use of destination areas. However, there are many established techniques for calculating these. In some areas the limiting factor may be hydrological; lakes with small through-flow are easily polluted - in others it may be botanical; dune flora are extremely vulnerable to transplanting, and so forth. Ecological considerations should be given high

significance in capacity ratings in the refined model. We doubt that they can be incorporated in the prototype, nevertheless, the ecologist planners will certainly be able to cry "stop!" to any specific effort to satisfy demand that would result in environmental damage.

Cost criteria are not specifically incorporated into the model concept at this stage, although it is conceivable that they might be in a highly refined version. There is, however, a user-cost component included in the attractivity index (block S3) and, in comparison with population-income segment criteria this can be expected to provide sound guidelines for what facilities people can and will afford, even with the prototype model.

Location

Both prototype and refined models are designed to distribute recreation demand and participation spatially into the selected distribution zones from all origin zones. The result should be a reasonable estimate, even from the prototype, of the pressures which each destination zone can be expected to experience, and should provide a basis for estimating the peak and average pressures on city-country transport links.

Solutions will be the prerogative of planners and decision-makers. In many zones pressures may justify creation of artificial resources - in others the strict preservation of the natural state.

As happened in the MTARTS study, there will, we anticipate, be a problem in determining where the growth of demand will occur. The pres-

sures on resources will differ by orders of magnitude according to whether we develop a system of satellite cities, new towns or an open-matrix (or reticular) Metro. The model cannot forecast this because it can only compute the effects of the variables fed into it. However, it will be possible to test it with alternative distributions and so obtain estimates of the effects of alternative urbanization policies on the outdoor recreational aspects of life in Ontario.

<u>Timing</u>

The basic demand segment of the model will be capable of being manipulated in a number of ways. For this reason we have not shown any time-dimensional change block on the diagram. It is possible to introduce a programmed formula for population/family-structure/income growth into block G2. This would yield estimates of demand distribution for as long a time horizon as desired. Under this system growth rates could be altered for any component, assuming the programs are available, and these would produce alternative quantities of tourism and recreation consumption for every zone.

Alternatively, it would also be possible to postulate population, incomes, family structures on a "scenario" basis for any given future year and similarly compute the demand, participation and consumption for recreational opportunities.

We believe that both of these methods should be applied in tests of the prototype model, because such a procedure will provide tre-

mendous insight into both the scope of pressures that may be experienced in the future and the relative sensitivity of demand, participation and consumption to changes in various socio-economic measures.

The preceding paragraphs have outlined a structure for the principal data required for tourism and recreation planning on provincial and regional scales and have shown how the model, in both prototype and refined stages, has been designed to provide such data. The following pages will describe some foreseeable applications of the model to hypothetical practical situations.

EXAMPLES OF PLANNING QUESTIONS

Through the co-operation of the Technical Sub-Committee of the Tourism and Outdoor Recreation Plan Committee, a set of questions were provided to us to serve as examples of the sort of issues a planner might hope to use the model in resolving. A list of 16 such questions was provided, and while all were discussed with the Technical Sub-Committee, we feel that a selection of them should be presented here for the general information of all readers of the present report. The questions have been selected to cover the range in a representative manner. They do not, however, deal with all areas where we feel the model will be of use. In order to present such areas, which largely deal with the formulation of broad plans and policies, we have expanded on the direct answers to the specific quiestions. In each case we make the appropriate distinction between the use of the refined model and the use of the prototype.

1. Evaluation of Alternatives

How will the model allow for the evaluation of alternative plans, investments, and resources? Can benefit-cost and other evaluation techniques be related to the model output? Is economic evaluation built in?

The model is intended to "allow for" alternative plans, but it does not make such plans. The model provides information on which plans can be based and, once they are formed, provides information on how they will work. The model outputs, such as usage of recreational resources, the extent to which latent participation is reduced, etc., can be compared in each case for which the model is run with alternative plans fed into it. Planners can then see what effect different investment and development plans would have on consumption, participation and demand for recreation activities and in trip making.

In dealing with the issue of benefit-cost ratios, we believe that it is most appropriate not to include benefit criteria in the model. In our opinion, this is a matter for the government to decide in an overall social and economic policy framework. The outputs of the model, however, include virtually every aspect to which a benefit might be ascribed, so that planners can calculate such measures on whatever basis is adopted. The important elements that the model contributes to such an analysis are its comprehensiveness, in the sense that it covers all areas of the Province and all aspects of recreation and tourism, and also the uniform basis it provides for looking at all parts of the broad problem at one time. We must, therefore, answer that the model output most definitely can be

related to benefit-cost and other economic evaluation techniques, but that these will not be built into the model.

We feel that the prototype version will be reasonably competent in handling the analysis of alternative plans. Even if the absolute numbers are wrong in some segments of the early model, the comparative analysis of the output of one run with that from another should still have some validity, since the same biases would be operative in each case.

2. Traffic Flow

What effect would doubling the cottage population in Muskoka have on the road system?

The model, even in its most refined form, will not be used to simulate traffic flows on specific roads. We believe that the Department of Highways is the appropriate agency to do this, since it must bear the responsibility for considering all types of road traffic for all trip-purposes.

We do believe, however, that the outputs of the model can be of great assistance to it in so doing, both in specific cases such as the one that the question deals with, and in more general ways.

If cottages were doubled in a given region, the model outputs would show the increases in trips for that zone for cottaging, and would also indicate from which origin zones cottage trips increase. It might also show decreases in other types of trips if the effect of so many cot-

tages were to decrease day trips from, say, Orillia. It would also show effects on cottage trips to other zones.

Perhaps the most exciting aspect of the refined version of the model would be its potential for accurately reproducing complex origin/destination patterns of many different types of recreational trips. If sufficient experience were gained with the model, it might be feasible to simulate whole origin/destination surveys, saving considerable expenditures of funds.

The prototype model cannot be relied upon for accurate origin/destination information for the most part. It would, however, be useful on a comparative basis, for example, to compare the effect on cottage trip-making from Toronto to Muskoka <u>or</u> to Haliburton, under the assumption that cottage numbers in each are doubled, in turn.

3. <u>Increased Costs</u>

What effect will increased (municipal) taxation have on participation in cottaging?

The effects of cost of an activity can come into the model in several places. One is the establishment of the activity preference schedules. We do not assign groups high preferences for large amounts of a mode of recreation they cannot afford. Thus, an increase in the cost of cottaging, whether through increased municipal taxation or some other across-the-board boost in costs, would tend to reduce cottaging demand in an inverse relation to income. This would be felt throughout the model

in decreased participation and consumption of cottaging. Probably the effect would be low, however, unless the increase in cost of a given sort were considerable in relation to the total cost of the activity.

If the cost changes for an activity are not a blanket charge on the whole activity, but are selective either in terms of region or on a seasonal basis, then other mechanisms of the model would show the effect of the change. An increase in costs applied only, say, to a few zones would be represented by a lowering of the attraction index for those zones. A selective cost increase of this type could result if, for instance, centralized sewage systems were required in certain zones and not in others.

The prototype will be able to handle such problems on an experimental basis. Without more data on cottaging and more model experience with it, we cannot say exactly how much effect costs really do have on cottage participation in the whole system. The point is, however, that we shall never find out unless we have the model and are willing both to gather selected data for it and to use it to analyze them as they become available.

4. Land-Use Standards

How will land-use standards be handled? Will we know whether to further develop a primary resource, or open up a secondary source?

The whole question of land-use standards is difficult. It relates as much to the specific ecological attribute of a specific resource (which

the model <u>will not</u> give us) as it does to levels of use (which the model <u>will</u> estimate). The model will tell what would happen, in terms of use, if certain standards were applied, for these will affect the capacity levels that are part of the attraction indices for the zones. It would tell what would happen in terms of use if standards were changed in some direction or another, or in some specific zone or another. It can present the usage conditions, their effects on supply opportunities, participation and demand, but policy on standards must also be based on ecological criteria which are not in the model as such.

The prototype can produce reasonable approximations of what the effect of standards might be, appropriate to the preliminary nature of the prototype, and dependent on the validity of the activity data that are provided to it initially.

5. <u>Marinas</u>

What volume, number and location of marina facilities would be optimum for Prince Edward County?

This question can serve to illuminate several interesting and important points. The first is that there is no notion of "optimum" built into the model. As pointed out earlier, such evaluations can only be derived from results of the model when the planner applies a criterion for optimality. The model outputs, however, are the basic data on which such analysis must rest.

Further, the model is designed to operate only on a county basis. Only refinement of the model beyond what is foreseen at present, such as going to a set of zones at the township-level, would give information on where to locate facilities within a county. For the near future, then, such decisions would have to be based on more detailed resource studies outside of the model.

For the vital question of the overall level of recreational resources to develop, however, the model can provide considerable assistance. For example, a series of increasingly-large investments might be feasible for a given county. The model could test these one by one to illustrate what the usage would be in each case. It would show "saturation levels" as well; for instance, when the selected county starts to draw usage away from others and thereby decreases the return on investments in the other zones. The model permits the selection of investment levels to be considered on a province-wide basis. It further permits consideration to be given to the degree of unsatisfied demand filled by different plans, as well as to the actual consumption figures resulting from each. It may be considered more important socially, for example, to develop recreational resources of certain kinds in areas where none now exist, i.e., where consumption is low but demand is high, than to provide increments of such resources to favoured areas where consumption is already high.

Insofar as the prototype model is concerned, the sort of analysis proposed in answering the present question is likely to be reasonably

successful. Prototype model runs comparing one level of development of recreational resources with another level in a given zone will probably be valid. The validity will depend on the comprehensiveness of the data for the activity involved. For boating, destination data is not as good as for, say, camping, but it is better than for activities such as walking for pleasure.

USE OF THE PROTOTYPE MODEL FOR DESIGNING AN INFORMATION SYSTEM

Even the process of developing the model concepts has brought to light a number of specific gaps and inadequacies of data. The identification of these gaps permits us to focus on problems of this nature, and their priorities, and should help us to develop an information system for monitoring and planning for recreation and tourism more effectively than ever before.

We are aware even now of a number of gaps in our understanding of the true significance of certain factors which affect or appear to affect recreation patterns. We anticipate that during the construction of the prototype model, a number of these problems will be resolved when the model is used to test its sensitivity to these factors.

We also expect that continuing experience with the model, based on different assumptions regarding the detail and precision of data for each of the various factors, will lead to a data-gathering solution that will be both comprehensive and economical.

USE OF THE PROTOTYPE MODEL IN CHANNELLING RESEARCH

A great deal of fundamental research still remains to be done in the field of recreation behaviour. For example, motivational research is in its infancy, and so far has really been usefully directed only towards designing promotion programs for specific products or destinations. Present methods therefore are not applicable in any sense to comprehensive planning needs.

We expect that certain patterns will emerge from our method of dealing with the various elements of recreation, and their interaction, and that these are likely to give valuable guidance to specifying behavioural knowledge that is still needed. The mere act of formulating the initial prototype will not provide all of this information, but we do anticipate that continuing experience with the prototype model will yield suggestions for research projects that could be undertaken by government, universities or other research organizations, and whose results could contribute significantly to the refined model.

V - CONCLUSIONS

FEASIBILITY OF CONSTRUCTING A PROTOTYPE MODEL

As we pointed out in the first section of this report, we have devoted considerable effort to the problem of what the ultimate form of the recreation system model should be, as well as to the problem of what the initial prototype model could be. Section three presented the technical issues involved in making the refined model operational, and also the specific issues raised for making the prototype model operational based on data for the calibration year, 1966.

On the basis of our exploratory work, we are able to conclude that implementation of the prototype form of the model in the manner outlined is feasible and to recommend that it be initiated.

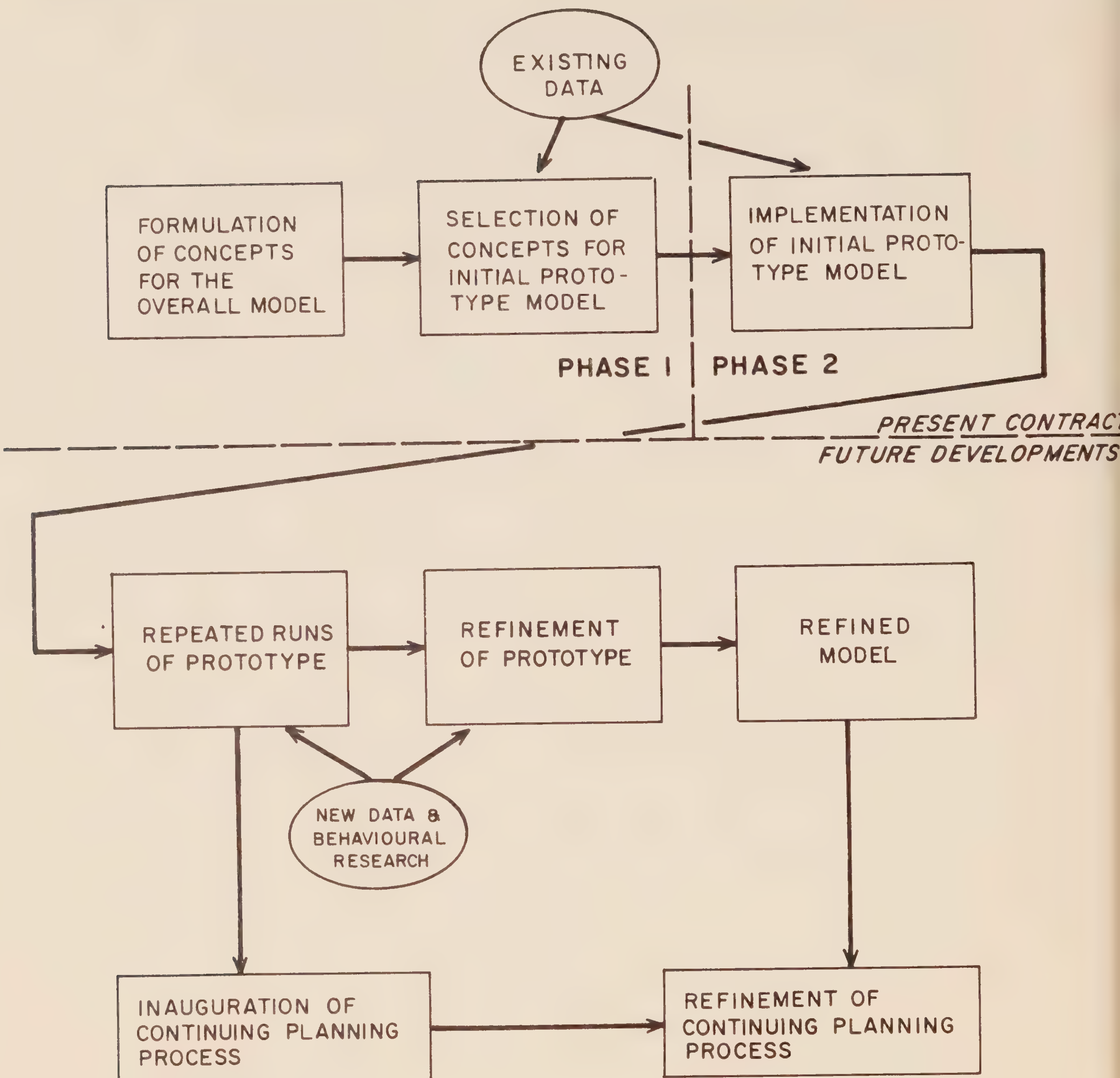
We believe that the prototype form of the model can be programmed and calibrated in the manner suggested, with due allowance made for the fact that, where required data are not available, we will use our best judgement either to extract the required values and relationships from analogous data, such as U.S. sources, or to provide an informed estimate of what they might be.

APPLICATIONS OF THE PROTOTYPE MODEL

It is important to note that we see the prototype model work of Phase Two of the present contract as being merely an initial step in

FIGURE V-1

SUMMARY OF MODEL DEVELOPMENT



two processes, that of model building and that of planning. We believe, however, that the prototype stage is an indispensible one to progress on both of these processes.

Figure V-1, opposite, gives a simplified synopsis of the point we have reached so far, and what our view is for future developments based on the prototype model.

REFINED MODEL DEVELOPMENT

In our opinion, the prototype version of the model will be essential to the development of the model-building effort. It will permit the effort to begin, in fact, and will show the areas in which further research and data collecting efforts will be most rewarding in terms of effectiveness and economy. Experience of ourselves and others in developing complex behavioural models has shown again and again that the model building proces is most effective when one approaches it on a staged basis, moving from prototype to more refined models, rather than trying to develop a refined model in one single step.

ECONOMY OF THE PROTOTYPE MODEL

The economies to be gained through this common and unified approach to planning, starting with the prototype model as a major focus and tool for program budgetting efforts, for example, can be substantial. Perhaps the most significant economy to be gained rests in assuring against the possible misuse of our irreplaceable natural resources, including general

landscape features such as river valleys, escarpments, and so forth. Naturally, the model is but one tool in this total process. But even in such an apprently mundane area as data collection and analysis, the modest investment in the Phase Two development of the prototype has the potential to be repaid several times over. Data collection programs can be expensive. The use of the data, once collected can be surprisingly limited without effective analysis. The development of the prototype model will permit establishment of program priorities and budgetting information for data and research, and will delineate the scope and detail of such programs. It can serve as a useful tool to tie the recreational and environmental quality aspects into the regional development planning process of the report by the favourable C. S. MacNaughton referred to in Section I. Most important, the prototype model will initiate a process which can be effectively used in sharpening a broad and comprehensive tool for the planning of the environment for our people and our visitors.

INITIATION OF A PLANNING PROCESS

We believe that a planning process structured without some comprehensive tool to weigh and integrate all relevant factors of recreation and tourism - people, demand, participation, consumption, access, opportunities, activities, facilities, resources - will be much less than what was called for in Design for Development and in later amplifications of its concepts. We know that the demands of the Government are high in this regard.

We further believe that the prototype version of the model will provide a useful, and possibly essential, stimulus to the introduction of the comprehensive planning process in tourism and recreation. The existence of such a tool will give the various government agencies a common ground on which to meet to integrate the programs that they administer in this area, and in addition it provides the basis for a common framework of analysis and evaluation of their different plans and policies.

APPENDIX A

GLOSSARY OF TERMS

APPENDIX A

GLOSSARY OF TERMS

ACCESSIBILITY

A quantitative measure of the relative proximity in terms of travel time, distance and cost of any given area where people reside to areas where recreational facilities of varying levels of attractivity are located. It takes into account all recreational resources for a given type of recreation and their spatial distribution around a given zone of residence.

ACTIVITY/ACCOMMODATION PACKAGE

This term is used to designate the total experience involved in a trip away from home for one night or longer, in which one or more recreational activities are engaged in, and some form of lodging or accommodation is used.

ATTRACTION

A quantitative measure of the key characteristics of a recreational area that provide pleasure and/or satisfaction for users desiring a given recreation activity or type. The characteristics would include measures of the quantity or capacity, quality, user cost and variety of facilities for each specific activity, or activity/accommodation package in the recreation area.

CONSUMPTION

A quantitative measure of the number of person-days, by activity, of the recreational use of a given area, irrespective of the zones of residence of the persons who use the given area.

DEMAND

The amount expected in person days, of a given recreational activity, that a given population group would be willing and able to participate in, assuming that there are no limitations due to accessibility, quality or capacity.

DEMAND SCHEDULE

A list pertaining to a given socio-economic group showing the relative amounts of leisure time for all the defined leisure activities (or activity/accommodation packages) which an individual in that group demands.

DISTRIBUTION

The process of allocating people in each area of residence to locations of recreational use in which to carry out their schedule of participation in various recreational activities.

EXCESS PARTICIPATION

This is an amount of participation in one or more activities in excess of the amount assigned a group in their demand schedule. This

could happen if the opportunities for a particular activity were very high as seen from an area of residence, while at the same time the opportunities for their leisure activities were very low. In such a case, substitution of the available activity for other activities that are demanded but unavailable, could produce a participation rate in excess of normal demand.

HOME-BASED RECREATION

This is defined as being any form of recreation that involves a single activity-purpose during a day or part of a day and does not involve the use of any form of lodging or accommodation away from the home or permanent residence.

LEISURE-TIME BUDGET

This is the number of specific length time period or time quanta over a year or part of a year, of discretionary leisure time for a particular group of people.

MOTIVATION

That process which furnishes an incentive or inducement to action. It may be non-directed and dependent upon certain social, economic and psychological factors or it may be directed towards a specific goal-set of actual opportunities to conduct recreational activities.

NON-RESIDENT

A person who does not have a permanent residence in the Province of Ontario.

NON-HOME-BASED-RECREATION

This is defined as being any form of recreation that involves participation in one or more activities away from home (or permanent residence) for a duration of one night or longer, and consequently involving also some form of overnight accommodation.

OPPORTUNITY

Opportunity for a given recreational activity, in a given area of residence, is an indication of the ability of persons in that area to participate in an activity resulting from the amount and characteristics of supply of the activity in the area, as well as in surrounding areas which have varying degrees of accessibility to that area of residence.

PARTICIPATION

A quantitative measure of the number of person-days, by activity, of the recreational use which persons who live in a given zone of residence generate, irrespective of the area in which the activity takes place.

PERSON-DAY

A person-day is a unit used to measure the demand, participation or consumption of a particular recreational activity, and is that amount which is represented by one person doing the activity for one day or a part thereof.

RECREATIONAL ACTIVITY

A recreational activity is defined for purposes of our study as any pursuit that is engaged in by persons during their leisure time, and that is distinct in some way from other activities.

RECREATION RESOURCE

The land, capital improvements to the land, and natural resources whose present or potential use has some recreational content.

RESIDENT

A person who has a permanent residence in the Province of Ontario.

SUPPLY

The total existing recreational resources for a particular activity in any given zone.

TRAVEL RESISTANCE

A mathematical function that inter-relates the length of a trip to the amount of travel that is deterred or inhibited as the length increases.